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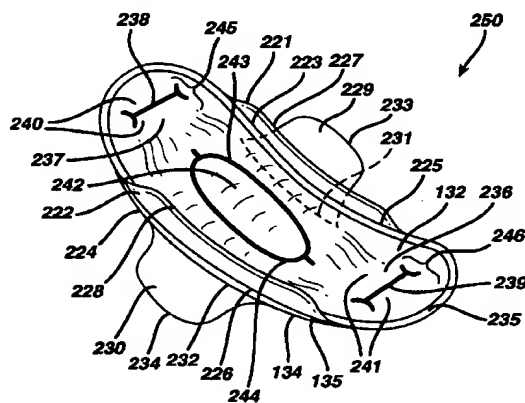
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**(54) Absorbent products having conforming means**

(57) This invention provides protective products feminine hygiene absorbent such as sanitary napkins that have conforming means in their end regions that, in use, facilitate the products' ability to fit close and conform to the body, resist transverse bunching and prevent leakage of fluid from the edges. The conforming means (245, 246) consists of a stiffened element (238, 239) and a non-stiffened region (240, 241) immediately adjacent the stiffened element that cooperate to bend, fit and conform. The stiffened element, such as an embossed channel (243, 244) or regions that are stiff, densified or reinforced, bends along its axis of bending and resists bending and compression orthogonal to that axis. The non-stiffened relatively unconstrained region (240, 241) puffs outward to fit and conform to the body. The center region (242) of the napkin may optionally contain a stiffening means, such as extra absorbent material, a sphagnum moss containing insert and an embossed channel (243, 244); the stiffening means (243) of the center region (242) being spaced apart from the stiffened element (238, 239) of the end region (236, 237). The absorbent product may also optionally have cuffs, or optionally have undergarment wrapping wings (229, 230), where such cuffs or wings synergistically cooperate with the conforming means (245, 246) of this invention to provide full and reserve coverage of and conformability to the body. This is true for cuffs, and especially for wings (229, 230), and most especially for wings that are attached inwardly of the longitudinal edges of the absorbent element (135), such wings pro-

viding gathering of the crotch of the undergarment without diminishing the strike zone that is available to capture body fluids.

**FIG. 21**



## Description

### FIELD OF THE INVENTION

This invention relates to protective absorbent products used by women for feminine hygiene, and more particularly to improved sanitary protection products such as sanitary napkins, panty liners and incontinence products that, in use, fit closely and conform to the body, resist transverse bunching and prevent leakage of fluid from the edges.

### BACKGROUND OF THE INVENTION

Protective absorbent products are commonly used by women for feminine hygiene to absorb body fluids, such as menstrual fluids, intermenstrual fluids and urine. It is important that these products prevent such fluids from escaping the confines of the absorbent materials and edges of such products and thereby staining the wearer's undergarments and outer clothing. Current product designs attempt to provide coverage of the body without being bunched, folded and otherwise having their absorbent regions reduced in size and removed from contact with the body; fit close to the body to prevent fluid from running along the body before it is absorbed; quickly absorb and retain the fluids and do not permit them to escape the confines of the porous surfaces of the product, or their external edges, onto the wearer's clothing; and by being comfortable and not irritating to the wearer. Examples of such products are sanitary napkins that additionally have: flaps or wings attached to the edges of the napkins, such as are described by McNair in US 4,285,343 and by Mattingly in US 4,608,047, or attached to a fixation point on the absorbent element of the napkin inwardly of the longitudinal edges of the napkin, as described by McCoy in US 4,900,320; cuffs; interlabial protrusions; and extra absorbent materials, layers and structures strategically placed throughout the absorbent body of the napkin.

Attempts have been to prevent a napkin from bending and bunching, especially in the rearward portion of the napkin, by reducing the size of the rearward portion or by providing a preformed arcuate profile in the rearward portion of the napkin, the drawback being that such means further limit the absorbent area of the rearward portion. Several inventions, that attempt to prevent a napkin from bending and bunching, describe the use of predominantly centrally located channels, pleats or slits that generally follow the longitudinal dimension of the napkin, some of which also reduce the width of the product or promote reduction of its width in use; and none of which help the ends of the product conform and adapt to the surface of the body in use. Thus, Strongson in US 2,331,355 describes a catamenial pad having a central gathered, extra thickness portion of reduced width which is attained by gathering the pad about a pleat below the central portion; or by splitting the

absorbent material in the central portion longitudinally, as well as optionally outward from the longitudinal split, and gathering the absorbent material upward between the slits. Romans-Hess et al in US 4,655,759 describe a sanitary napkin that has embossed channels, located adjacent the longitudinal edges, that in use are said to permit the sides of the napkin to fold upward to form an occlusive container. However, the sides of such napkins, in use, either stay flat or fold downward, thereby reducing the strike zone available to accept body fluids. Glassman in US 4,758,240 describes a menstrual or incontinent pad that embodies a longitudinal centrally located interlabial-entering ridge bearing a deep channel, the pad having on either side of the ridge a multitude of spaced apart channels that increase the lateral compressibility of the pad, without it folding downward, when the pad is subjected to lateral compression in use. Pigneul in US 4,790,838 describes a sanitary napkin comprising a fluid absorbent pad component having: biconcave longitudinal sides that define a biconcave central area of reduced width that is contained between a fluid permeable cover and an impermeable barrier; and a wide wing area extending beyond the pad component in the biconcave region, the wide wing area consisting only of the cover and barrier sealed to each other in arcuate pleats that are concentric with the biconcave sides of the pad. A further feature of the device includes one or more arcuate grooves in the mass of the pad component, that are preferably concentric with the concavities of the central area. Glaug et al in US 5,399,175 describe an absorbent structure provided with two or more longitudinal chambers of absorbent material that are separated by repellent walls, that direct fluid along the longitudinal axis of the structure.

Several patents provide transverse channels alone or in combination with longitudinal channels. None of these, for reasons to be discussed, have the effect of significantly helping the ends of the product conform and adapt to the surface of the body in use. Thus, Mogor in US 3,575,174 describes the use of deep embossed channels impressed through the cover and core of a napkin, the channels being positioned near the lateral and end edges, on the body facing surface of the napkin, as well as at the rearward end of the napkin on the garment facing surface of the napkin. The channels on the body facing surface, although providing resistance to bending and bunching, also prevent the front and rear regions of the napkin from adapting and conforming to the mons pubis and to the posterior perineum. Molee et al, in US 4,773,905 and in US 4,936,839, describe winged napkins having a fluid retarding means, for example embossed channels, disposed transversely across a central absorbent element to retard the transmission of fluid from the central portion of the absorbent element to its transverse end portions. The napkin may also include fluid barrier seals, between the absorbent element and the wings, as well as fluid repellent means around the napkin's periphery.

Finally, Lindquist in WO 90/05514 describes an absorbent article having an absorbent body that includes a plurality of mutually sequential channel forming impressions, that have both transverse and longitudinal extending parts that are located at a distance from the periphery of the absorbent body; and where preferably that distance is such that the distance between mutually adjacent channels is smaller than the distance of the channels to the nearest edge of the absorbent body. The objectives of this last cited invention are to provide a preferred path of wicking of fluid from channel to channel instead of to the edges; to provide lateral stability by virtue of the lateral extending parts of the channels; and to provide flexibility along the longitudinal axis of the article at hinge sections between sequential channels. However, to provide a preferred path for wicking fluid, such sequential channel impressions must be at a distance from the periphery and quite close to each other; and will not adequately: resist sideways compression; prevent fluid from reaching the edges of the product; provide conforming means that permit the end regions of the napkin to conform and adapt to the surface of the body in use. The channel impressions must also be located in the central region, as well as in the end regions, to sustain the path of wicking. Such centrally located channels, in use, become hinges that prevent the napkin's central region from remaining flat beneath the relatively flat longitudinal region of the labia majora, thereby causing the napkin to bend concavely away from the labia majora.

### SUMMARY OF THE INVENTION

It is an object of the present invention to provide a disposable absorbent product for use in feminine hygiene which is adapted to cover and closely fit the perineal area of the wearer.

It is another object of the present invention to provide an absorbent article having a central region which is adapted to cover the vestibule and labia majora of the wearer, a forward end region adapted to cover the mons pubis of the wearer, and a rearward end region adapted to cover the posterior perineum of the wearer.

In accordance with the present invention, there has been provided a protective absorbent products for use by a woman for feminine hygiene, and more particularly to improved sanitary protection products such as sanitary napkins, panty liners and incontinence products, that have conforming means, comprising stiffened elements and unstiffened regions in their end regions that, in use, facilitate the products' ability to fit close and conform to the body, resist transverse bunching and prevent leakage of fluid from the edges. Thus, the absorbent products of this invention, have a central region which is adapted to cover and fit the labia majora and the vestibule contained within, and end regions adapted to cover and fit the body's anterior region of the mons pubis as well as the body's posterior region consisting of the pos-

terior perineum, respectively.

The absorbent product of this invention comprises a liquid permeable body facing layer, a liquid impermeable garment facing layer, an absorbent structure therebetween defining an absorbent element. The absorbent element has longitudinal edges opposite each other defining a width dimension, a central longitudinal axis parallel to the longitudinal edges, transverse edges opposite each other defining a length dimension, and a thickness dimension. The absorbent element further comprises a central region, a first or anterior end region and a second or posterior end region. The central region has longitudinal edges coincident with the longitudinal edges of the absorbent element as well as first and second distal ends opposite each other defining an area that is sufficient to cover at least the woman's vestibule and labia majora in use. The first or anterior end region, extending from the first distal end of the central region, is adapted to cover at least a portion of the woman's mons pubis in use. The second or posterior end region, extending from the second distal end of the central region, is adapted to cover at least a portion of the woman's posterior perineum in use.

The absorbent product of this invention further comprises at least one conforming means, contained within the at least one end region, the conforming means comprising a nonstiffened region adjacent the distal end of the central region and adjacent to a stiffened element, the stiffened element being located inward of the transverse and longitudinal edges of the absorbent element. The non-stiffened region extends transversely across the end region, generally perpendicular to the central longitudinal axis of the absorbent product from one longitudinal edge of the absorbent element to the opposite longitudinal edge of the absorbent element. The stiffened element extends transversely across the end region, generally perpendicular to the central longitudinal axis of the absorbent product, at least at its intersection with that axis, and centrally occupies at least 50% of the width of the absorbent element. The stiffened element, in use, resists transverse bunching and in combination with the nonstiffened region, in use, enables the end region of the absorbent product to preferentially bend and to closely fit the body. The stiffened element may also act as a barrier to fluid wicking and guide the fluid so that it is retained within the confines of the absorbent element. The conforming means thereby provides an axis of bending, that coincides with a transverse axis of the napkin, a resistance to bending and compression orthogonal to that axis, i.e., along the longitudinal axis of the napkin and a relatively unconstrained region that may puff and cuff outward to fit and conform to the body. The stiffened element may optionally be adapted to prevent leakage of fluid from the edges, as hereinafter described. The stiffened element may of itself be a bending means, or may include a separate bending means, such as an embossed channel, or may comprise a projection, pleat, slit, hinge means or

thinned area, that provides an axis of flexibility, coincident with the axis of bending of such bending means as well as providing stiffening and compression resistance orthogonal to the axis of bending.

The center region may optionally contain one or more stiffening means, such as extra absorbent material, a sphagnum-moss containing insert, an embossed channel having a component parallel to the central longitudinal axis, and combinations thereof. Embossed channels are preferably located between the central longitudinal axis and the longitudinal edge, provided of course that the stiffening means in the central region is spaced apart from the stiffened element in the end region. The stiffening means maintains the centre of the absorbent element in a relatively flat profile along the longitudinal axis, and resists bending of the absorbent element transversely to that axis, so as to effectively conform to the body in that region, resist transverse bending and bunching and thereby prevent leakage of fluid from the absorbent element.

In accordance with another embodiment of the present invention, the absorbent product may also have cuffs, undergarment wrapping wings or tabs that are either attached to the edges of the absorbent element or attached inwardly of the longitudinal edges of the absorbent element. Such cuffs, wings or tabs help maintain the surface of the central region of the napkin, flat and spread open, along the napkin's longitudinal axis. Additionally, such cuffs or wings or tabs have been found to cooperate with the conforming means of this invention to provide full and reserve coverage of and enhanced conformability to the body, by the absorbent product, in use. In a preferred embodiment the wings or tabs are attached inwardly of the longitudinal edges of the absorbent element, such wings or tabs gather the edges of the undergarment under the absorbent element without diminishing the strike zone that is available to capture body fluids.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of an hourglass shaped sanitary napkin of this invention comprising conforming means each having one stiffened element and an adjacent unstiffened region in each of the end regions.

Fig. 2 is a cross sectional view taken through axis A-A of Fig. 1, wherein the stiffened element is an embossed channel.

Figs. 3 through 7 are cross sectional views taken through axis A-A of alternative examples of configurations of the embossed channel stiffened element shown in Fig. 1.

Fig. 8 is a plan view of a rectangular shaped sanitary napkin of this invention comprising one end region with a conforming means having two stiffened elements; and a second end region with a conforming means having one stiffened element.

Figs. 9 through 10 are cross sectional views taken

through axis A-A of Fig. 8, through the end region having two stiffened elements, of examples of alternative configurations of the two stiffened elements.

Figs. 11 through 13 are plan views of rectangular shaped sanitary napkins of this invention comprising alternative designs of a stiffened element that may be part of the conforming means in each of the end regions.

Fig. 14 is a cross sectional view through axis A-A of a stiffened element shown in Fig. 1, wherein the stiffened element comprises a reinforcing strip of additional material.

Fig. 15 is a plan view of a rectangular shaped sanitary napkin of this invention comprising end regions each having a conforming means that has a stiffened element; and a central region having a stiffening means.

Fig. 16 is a plan view of a rectangular shaped sanitary napkin of this invention comprising end regions each having a conforming means that has two stiffened elements; and a central region having a stiffening means.

Fig. 17 is a perspective view of a rectangular shaped sanitary napkin of this invention comprising end regions each having a conforming means that has a stiffened element, a central region having a stiffening means; and the central region having more absorbent in the absorbent structure than do the end regions.

Fig. 18 is a perspective view of a rectangular shaped sanitary napkin of this invention having cuffs attached to the longitudinal edges of the absorbent element.

Fig. 19 is a perspective view of an hourglass shaped sanitary napkin of this invention having tabs or wings attached to the longitudinal edges of the absorbent element.

Fig. 20 is a perspective view of a rectangular shaped sanitary napkin of this invention having tabs or wings attached inwardly of the longitudinal edges of the absorbent element.

Fig. 21 is a perspective view of a rectangular shaped sanitary napkin of this invention having cuffs attached to the longitudinal edges of the absorbent element and tabs or wings attached inwardly of the longitudinal edges of the absorbent element.

Fig. 22 is a plan view of a sanitary napkin of this invention showing examples of bending axes along which bending resistance measurements were made.

Fig. 23 is a graph of bending resistance measurements made perpendicular to the central longitudinal axis of napkins with and without the conforming means of this invention.

Fig. 24 is a graph of bending resistance measurements made parallel to the central longitudinal axis of napkins with and without the conforming means of this invention.

## DETAILED DESCRIPTION OF THE INVENTION

This discussion is primarily directed to describing the present invention and its use as a unique absorptive structure for feminine hygiene, with examples being given as sanitary napkins. However, this invention is meant to apply equally well, with such necessary modifications as will be known to those skilled in the art, to products such as panty liners, incontinence products and diapers.

Referring now to the drawings in detail, wherein like numerals indicate the same elements throughout the views, Fig. 1 is a perspective view of a sanitary napkin 30 having comprising a liquid permeable body facing layer 2, a liquid impermeable garment facing layer 4, an absorbent structure (not shown) therebetween defining an absorbent element 6. Absorbent element 6 has:

longitudinal edges 8, 10 opposite each other defining a width dimension, a central longitudinal axis 11 parallel to longitudinal edges 8, 10, transverse edges 12, 14 opposite each other defining a length dimension, and a thickness dimension;

a central region 18 having a length which is sufficient to cover the woman's vestibule and labia major in use, the central region 18 having longitudinal edges 8, 10 coincident with longitudinal edges 8, 10 of absorbent element 6; and first and second distal ends 19, 20 opposite each other;

a first end region 22, adjacent to and extending from first distal end 19 of central region 18, the first end region 22 being adapted to cover at least a portion of the woman's mons pubis in use;

a second end region 24, adjacent to and extending from the second distal end 20 of central region 18, the second end region 24 being adapted to cover at least a portion of the woman's posterior perineum in use; and

conforming means, 31, 32, contained within at least one of the respective end regions 22, 24, the conforming means 31, 32 comprises a nonstiffened region 27, 29 respectively, adjacent to distal ends 19, 20 of central region 18 and adjacent to a stiffened element 26, 28, the stiffened elements 26, 28 being respectively located inward of transverse edges 12, 14 and longitudinal edges 8, 10 of end regions 22, 23.

Nonstiffened regions 27, or 29, extend transversely across end regions 22, or 24 respectively, generally perpendicular to central longitudinal axis 11 of absorbent element 6, and are immediately adjacent respective stiffened elements 26, or 28, respectively to conform to the curved surfaces of the body. Such nonstiffened

regions are located immediately adjacent all sides, edges and ends of the stiffened elements and are also located between stiffened elements when more than one stiffened element is present in the end region.

Stiffened elements 26, 28 extend transversely across end regions 22, 24, inward of the longitudinal edges 8 and 10, and are generally perpendicular to central longitudinal axis 11 of absorbent element 6, at least at its intersection with longitudinal axis 11 and centrally occupying at least 50% of the width of absorbent element 6. Stiffened elements 26, 28 are any means that rigidify the structure against transverse compression and bunching in use and that slow, channel or halt the migration of fluid that is wicking from any nonstiffened regions 27, 29, containing fluid, adjacent one side of such elements, to other nonstiffened regions on sides opposite the stiffened elements, not yet containing fluid. Stiffened elements 26, 28 may for example be embossed channels, densified regions, projections above the body facing layer, additional material strips reinforcing at least body facing layer 2, resin-containing regions of the absorbent structure, hotmelt-containing regions of the absorbent structure, superabsorbent containing regions of the absorbent structure, or combinations thereof. Stiffened elements 26, 28 also cooperate to confine fluid within absorbent element 6, such elements being located inwardly of transverse edges 12, 14 and longitudinal edges 8, 10 of end regions 22, 23. Stiffened elements 26, 28 also resist transverse compression and bunching, in use, being located transversely across the end region, generally perpendicular to the central longitudinal axis of the absorbent product, at least at its intersection with that axis, and centrally occupying at least 50% of the transverse width of the end region. It is preferred that stiffened elements have at least one lateral component located transversely across an end region generally perpendicular to a central longitudinal axis of the napkin, at least at its intersection with that axis, and centrally occupy at least 50% of the transverse width of the end region and less than 95% of the transverse width of the end region.

Stiffened elements 26, 28, in use, resist transverse compression and bunching; and may bend along axes of bending, if such are present as in embossed channels, the axes of bending coinciding with transverse axes of napkin 30. Stiffened elements 26, 28 may also act as barriers to fluid wicking and guide fluid so that it is retained within the confines of absorbent element 6.

Nonstiffened regions 27, 29, in use, enable the absorbent product to preferentially bend transversely to the longitudinal axis of the absorbent element and to closely fit the body along the length of napkin 30. Conforming means 31, 32 thereby provide both: stiffened elements 26, 28, that may bend along their axis of bending, that coincides with a transverse axis of napkin 30, and resists bending and compression orthogonal to longitudinal axis 11 of napkin 30; and a nonstiffened region that preferentially bends to permit the end region to con-

form to the body. The stiffened element additionally may prevent leakage of fluid from the edges.

Embossed channels are a preferred embodiment of the stiffened elements of this invention. When stiffened elements 26, 28 are themselves relatively bendable along their length, as for example in embossed channels, they comprise a hinge means, that enables napkin 30 to also bend along stiffened elements 26, 28 and to conform to curved surfaces of the body. Embossed channels as stiffened elements 26, 28 also cooperate to confine fluid within absorbent element 6, such elements being located inwardly of transverse edges 12, 14 and longitudinal edges 8, 10 of end regions 22, 23. Embossed channels stiffen the napkin in directions perpendicular to the channels along their entire length. Therefore, channels that are aligned transversely in napkin 30 will resist bunching in a transverse direction; and channels that have a longitudinally oriented component will resist compression in the longitudinal direction of napkin 30. Thus, stiffened elements 26, 28 as embossed channels, and their adjacent nonstiffened regions 27, 29, cooperate to bend, conform and closely fit the body, to resist transverse compression and bunching, and at times longitudinal compression; and to prevent leakage of fluid from napkin's 30 edges. Embossed channels may be impressed into the absorbent structure alone of napkin 30, either from the body facing side or from the garment facing side of the absorbent structure. Embossed channels may be impressed into napkin 30 either from the body facing layer 2 or from the garment facing layer 4 through the any part of the thickness of absorbent element 6 and even up to protruding beyond the opposite facing layer; while taking in all such executions, not to perforate the garment facing layer, thereby destroying its fluid impermeability. Examples of such possibilities are illustrated in Figs. 2 through 7, as follows: Fig. 2 is a cross sectional view taken through axis A-A of Fig. 1, and limited to end region 24, wherein either of stiffened elements 26 or 28 is an embossed channel 32 that is impressed downward into body facing layer 2 and absorbent structure 7 beneath. Fig. 3 is a cross sectional view taken through axis A-A of Fig. 1, and limited to end region 24, wherein either of stiffened elements 26 or 28 is an embossed channel 34 that is impressed upward into the garment facing layer 4 and absorbent structure 7 above. Fig. 4 is a cross sectional view taken through axis A-A of Fig. 1, and limited to end region 24, wherein either of stiffened elements 26 or 28 is an embossed channel 36 that is impressed downward into body facing layer 2, absorbent structure 6 and garment facing layer 4 beneath. Fig. 5 is a cross sectional view taken through axis A-A of Fig. 1, and limited to end region 24, wherein either of stiffened elements 26 or 28 is an embossed channel 38 that is impressed downward into body facing layer 2, absorbent structure 7 and garment facing layer 4 and protrudes beyond garment facing layer 4. Fig. 6 is a cross sectional view taken through axis A-A of Fig. 1,

and limited to end region 24, wherein either of stiffened elements 26 or 28 is an embossed channel 40 that is impressed upward into garment facing layer 4, absorbent structure 7 and body facing layer 2 above. Fig. 7 is a cross sectional view taken through axis A-A of Fig. 1, and limited to end region 24, wherein either of stiffened elements 26 or 28 is an embossed channel 42 that is impressed upward into garment facing layer 4, absorbent structure 7 and body facing layer 2 and protrudes beyond body facing layer 2. Napkins may have more than one stiffened element in an end region; and the number and type of stiffened elements in each end region do not need to be the same. Thus, Fig. 8 shows a napkin 60 of this invention having one stiffened element 44 in end region 46 two stiffened elements 48, 50 in end region 52. Figs. 9 and 10 are cross sections of two alternative configurations, taken through axis A-A of napkin 60, shown in Fig. 8, and limited to end region 52.

Stiffened elements may have any shape or configuration and may comprise continuous segments, discontinuous segments, straight segments, curved segments or combination thereof. It is preferred that the elements be continuous. If the stiffened elements are discontinuous, it is preferred that the segments not be spaced apart from each other by more than 6.35 mm (0.25 inches) in order to maintain good fluid barrier properties and deformation and bunching resistance for the absorbent element. It is preferred that stiffened elements have at least one perpendicular component that is generally orthogonal to the lateral component and generally parallel to the central longitudinal axis of the absorbent product, and with the perpendicular component being closer to the longitudinal edge than it is to the central longitudinal axis. The perpendicular component need not be strictly orthogonal to the lateral component. It may also be at some acute or obtuse angle to the lateral component, and may extend towards the transverse edge, towards the central region, or both. It is important that the stiffened element be located inwardly of the transverse edges of the end region of the absorbent element, and is preferably approximately between 3.175 mm (0.125 inches) and 63.5 mm (2.5 inches) inwardly of the transverse edges of the end region.

Fig. 11 shows a napkin 80 of this invention having stiffened elements 54, 56 respectively, in end regions 58, 62, wherein each stiffened element comprises a lateral component 64, 65 located transversely across respective end regions 58, 62 and generally perpendicular components 66, 67, 68, 69, that are generally orthogonal to lateral components 64, 65 and generally parallel to the central longitudinal axis 72 of the napkin 80; and are closer to the longitudinal edges 74, 76 than they are to central longitudinal axis 72. Figs. 12 and 13 show napkins 85 and 90, respectively having examples of alternative stiffened elements 81, 82 and 86, 87 with lateral components 83, 83', 84, 84' and perpendicular components 53, 55, 70, 73, 77, 78, 88, 89.

Fig. 14 shows a cross section through axis A-A of

Fig. 1, wherein the stiffened region is a reinforcing strip 9 comprised of additional material. The additional material may be, for example, comprised of the same materials as that of the body facing layer, the absorbent structure, components of the absorbent structure, the garment facing layer, other plastic or fibrous materials, and combinations thereof. The center region of the absorbent product of this invention may optionally contain a stiffening means, spaced apart from the at least one stiffened element. Examples of stiffening means are such as extra or thicker absorbent material, a sphagnum moss-containing insert, a rigid insert, a semirigid insert, embossed channels, or combinations thereof. The stiffening means is located in the center region of the sanitary napkin and is spaced apart from the stiffened element so as not to compromise the conforming and fit to the body provided by the unstiffened region of the conforming means. The stiffening means maintains the center region of the absorbent element in a relatively flat profile along the longitudinal axis, in order to best cover and closely fit the body in that region and to resist transverse bending and bunching, and thereby prevent leakage of fluid from the absorbent element. The effect and benefit of such stiffening means is described in commonly assigned US Patent Application Serial No. 08/198, to McCoy, "Body Conforming Absorbent Article", which is herein incorporated in its entirety.

Examples of semirigid inserts include sphagnum moss and plastic sheets. Rigid inserts may be obtained by using thicker forms or laminates of the materials used for semirigid inserts. Embossed channels, in the form of at least one deeply embossed channel, either alone or in combination with other stiffening means, are a particularly preferred form of stiffening means; and are preferably oriented along the central longitudinal axis, thereby providing at least one longitudinal channel, and located anywhere between and including the central longitudinal axis and the longitudinal edge of the absorbent element of the absorbent product of this invention. Such channels may be straight or curved, curving outwardly from or inwardly toward the longitudinal axis. Other more complex curves, as may be conceived for such channels, may be used. It is further preferred that the distance between the stiffened element and each longitudinal channel of the stiffening means be greater than the distance between the stiffened element and any of the transverse and longitudinal edges adjacent the stiffened element, so as not to compromise the conforming and fit to the body provided by the unstiffened region of the conforming means; and to maximize the protection from leakage to the longitudinal edges afforded by both the longitudinal channels and the stiffening elements.

Fig. 15 is a plan view of a rectangular shaped sanitary napkin 100 of this invention with end regions 91, 92, each having a conforming means consisting respectively of a stiffened element 93, 94, in the form of an embossed channel, and an unstiffened region 95, 96;

and a central region 97 having a stiffening means in the form of two embossed channels 98, 99. Fig. 16 is a plan view of a dogbone shaped sanitary napkin 120 of this invention with end regions 101, 102 each having a conforming means consisting respectively each of two stiffened elements 103, 104, 105, 106 and an unstiffened region 107, 108; and napkin 120 also having a central region 109 having a stiffening means in the form of two embossed channels 110, 111. Fig. 17 is a perspective view of a sanitary napkin 130 of this invention with end regions 112, 113 each respectively having a conforming means 114, 115 consisting of a stiffened element 116, 117, in the form of an embossed channel, and an unstiffened region 118, 119; and napkin 130 also having a central region 124 having a stiffening means 121, 122, the central region having more absorbent 123 in the absorbent structure than do end regions 112, 113.

Napkins of this invention may be provided with a means for attaching it to the undergarment such as adhesive, protected by release paper until use, or by mechanical attachments such as a hook and loop assembly, clasp assembly, hinge assembly or by combinations thereof. Release paper may be eliminated if the napkins of this invention are packaged in a wrapper that has a napkin facing surface that is of itself releasable from adhesive by virtue of being coated or formulated with a release substance such as silicone or fluorocarbon or by being physically altered, such as by embossing, to reduce its contact with the adhesive.

Body facing layers may be comprised of at least a single layer or combinations of perforate film or foam or of a fabric such as is represented by wovens, knits and nonwovens, the nonwovens being represented by those such as are represented by the processes that produce spunbond, meltblown, needlepunched, thermobonded, chemical binder bonded, powder bonded, solvent bonded and hydroentangled fabrics. Perforate films may be such as those whose surfaces are flat or embossed, the bosses being of: micro size that may be visually detected as a matte finish or tactilely detected as having a silky, smooth feel; or of micro size where the individual bosses may be unaidedly seen or felt. The perforations may be two-dimensional, being essentially restricted to the plane of the film, or three-dimensional, where the film structure that defines and supports the perforations extends from the plane of the film and beyond, i.e., above or below, the plane of the film. Example of combinations of the materials are those that may be forced by physical unadhered lamination, adhesive or thermal lamination or by interpenetrating lamination, e.g., fibrous webs laminated to perforate films. The foams may be reticulated or non reticulated. The surfaces of body facing layers, i.e., outer facing surface, which is the facing surface of the absorbent structure, may be hydrophobic, hydrophilic, or one surface may be hydrophobic and the other hydrophilic or having gradients of hydrophobicity to hydrophilicity from one surface to the other.

The body facing layer of the absorbent product of



this invention may cover any part or all of the upper surface, that is the body facing surface, of the absorbent structure. It may alternatively wrap the absorbent structure partly or entirely around. Part wrapping of the absorbent structure is exemplified by the permeable body facing layer covering the top of and the sides of the absorbent structure. The body facing layer may be fixed or otherwise adhered to the surface of the absorbent structure overall or in discrete zones of attachment. Depending on the degree of coverage and wrapping of the absorbent structure by the body facing layer, it may be adhered to itself for example in an overlapping configuration at the bottom of the absorbent structure. The garment facing layer may cover at least the entire bottom surface, that is the garment facing surface, of the absorbent structure. It may also wrap around to cover the sides of the absorbent structure and even part of the body facing surface of the absorbent structure.

The absorbent structure may be comprised of absorbent materials that accept, transfer, distribute, store and retain fluid as well as prevent fluid from exiting the absorbent product. The absorbent structure may be a simple absorbent such as woodpulp, which may contain stabilizing components such as synthetic fibers, that are used as such, to form a bridging matrix; or by being thermobondable, are fused to themselves and to the woodpulp to form a dimension stabilizing structure. The synthetic fibers may be either hydrophilic, such as rayon, or hydrophobic such as polypropylene and polyester. The synthetic fibers may be made more wettable by treatment with a wetting agent such as a surfactant, by caustic etching of fibers such as polyester, by incorporating wettable polymers such as polyethylene oxide or polyvinyl alcohol within the fiber polymer formulation, by grafting the fiber surface with wettable reactants and by exposing the fiber to corona discharge. The peripheral profile of synthetic fibers may be of any shape, e.g., round, oval, multi-lobal. The synthetic fibers may also contain grooves, channels or bores; and may be pitted or perforated. The absorbent core may also contain auxiliary absorbents such as rayon or cotton fibers, sphagnum moss and superabsorbent fibers or particles.

Absorbents such as sphagnum moss, in board or in compressed layer form, may function additionally as compression resisting or deformation resisting structures or to help maintain a flat or raised product profile. Absorbents in board form may be made flexible and conforming by tenderizing by means of passing the board through a corrugating or embossing process. The woodpulp itself may also be comprised, at least in part, of any of wet crosslinked, dry crosslinked, chemically stiffened or curly fibers. The synthetic fibers and auxiliary absorbents may be present homogeneously throughout the absorbent core, in discrete layers or in continuous or discontinuous concentration gradients. The absorbent core may also contain foam in the form of layers or particles, the foam being either hydrophobic or hydrophilic, depending on its location and function in

the product, e.g., absorbing, cushioning, deformation resisting and compression resisting. The absorbent core may be uncompressed, compressed, or otherwise densified, at least in part. Compression and densification may be homogeneous throughout the absorbent core or in discrete layers or in continuous or discontinuous gradients of density.

The absorbent structure may contain, in addition to the absorbent core, a transfer layer, which is a low density fluid accepting and fluid releasing layer, usually located between the absorbent core and the permeable cover. The transfer layer may be comprised of relatively less hydrophilic materials and structures, than is contained in the absorbent core, such as of webs of melt-blown polypropylene or polyester fibers. Such webs may also contain woodpulp entrained within. Transfer layers may also be comprised of low density, highloft nonwoven webs comprised of woodpulp and synthetic fibers such as polyethylene, polypropylene, polyester, polyacrylonitrile and polyamide. Such highloft webs may be bonded with chemical binders or by thermal means such as by through-air bonding.

The garment facing layer may be fixed or otherwise adhered to the surface of the absorbent structure overall or in discrete zones of attachment. The garment facing layer may be adhered to the body facing layer in an overlapping configuration for example parallel to the sides of the absorbent element or parallel to the bottom of the napkin or in a flange seal extending from the sides of the absorbent element. When the body facing layer and garment facing layer are adhered to each other in a flange seal, the body facing layer may additionally be wrapped around the flange seal about the body facing layer; or the garment facing layer may additionally be wrapped around the flange seal about the body facing layer.

The impermeable garment facing layer may be of any flexible material that prevents the transfer through it of fluid but does not necessarily prevent the passages of gases. Commonly used materials are polyethylene or polypropylene films. Other materials that may be used as impermeable barriers may be chosen from films of polyesters, polyamides, ethylene vinyl acetate, polyvinyl chloride, polyvinylidene chloride, cellophane, nitrocellulose and cellulose acetate. Co-extruded and laminated combinations of the foregoing, wherein such combinations are permitted by the chemical and physical properties of the film, may be used. Fluid impermeable nonreticulated foams and repellent treated papers may also be used. Films that are fluid barriers, but permit gases to transpire, i.e., "breathable films", may be used. These may be chosen from polyurethane films and from micro-porous films, where micro-porosity is created by ionizing radiation or by leaching out of soluble inclusions using aqueous or nonaqueous solvents. Fabrics whose surfaces have been made repellent or whose pores are small by virtue of close packing of fibers, or whose pores have been reduced in size by closing off large liq-



uid admitting pores, may also be used alone, or together with breathable films, as breathable barriers.

The absorbent element may be of many different shapes and sizes, depending on the requirements of the user with reference to her anatomy, menstrual flow volume and intensity, duration of wear and the part of the day or night the product is being worn. For example, absorbent elements may be of generally rectangular shape, with generally straight or somewhat curved longitudinal and transverse edges, the corners defining the intersection of such edges being either square or rounded. Absorbent elements may also be narrower in the central region than in the end regions, being of for example, of dogbone or hourglass shape; or they may be wider in the central region than in the end regions, being for example of oval or round shape. The end regions may or may not be symmetrical about the central region. The end regions may or may not be the same shape or size as each other. The absorbent elements of this invention will have the following approximate dimensional ranges: a length dimension range of between 101.6 and 330.2 mm (4 and 13 inches), a width dimension of between 38.1 and 101.6 mm (1.5 and 4 inches), and a thickness dimension of between 1.27 and 25.4 mm (0.005 and one inch). The thickness of the absorbent elements of this invention may be uniform throughout the expanse of the absorbent element or, for throughout the expanse of the absorbent element or, for the purpose of specific fit, flexibility and absorbency requirements, the absorbent element may be thicker in some regions than in others. For example, a particularly preferred thickness profile is an absorbent structure that is thicker in the central region than it is in the end regions.

The absorbent products of this invention may also comprise auxiliary components that may add to the functional, comfort and aesthetic properties of the products such as gasketing cuffs or garment attaching tabs, the tabs being also known as wings or flaps. Such cuffs, wings or tabs help maintain the surface of the central region of the napkin, flat and spread open, along the napkin's longitudinal axis. Additionally, such cuffs or tabs or wings synergistically cooperate with the conforming means of this invention to provide full and reserve coverage of and conformability to the body, by the absorbent product, in use. This is true of cuffs and especially true of tabs or wings that are attached inwardly of the longitudinal edges of the absorbent element, such tabs or wings providing gathering of the crotch of the undergarment without diminishing the strike zone that is available to capture body fluids.

The cuffs and tabs or wings, as given below in the examples of sanitary napkins as absorbent products, may be attached to or be extensions of the sanitary napkin of the napkin's body facing side, napkin sides or garment facing side. The cuffs and tabs or wings may be comprised of materials that are different from those of the napkin, or may be comprised of materials of which

the napkin is made, or of combinations of the different materials and the materials of which the napkin is made. When the cuffs and tabs or wings are made of the materials of which the napkin is made, the materials may be attached to the napkin or be formed of extensions of the napkin's materials. Examples of constructions of cuffs and tabs or wings are: where the permeable cover material and the impermeable barrier material are attached to themselves, or to each other, along the periphery of the cuff or tab or wing structure, in discrete areas, or over their entire area of contact. The cuffs and tabs or wings may have laminated, between the cover and barrier materials, extensions of part or all of the absorbent body, for example extensions of one or both of the transfer layer and a portion of the absorbent core. The tabs or wings may be provided with adhesive, protected with release paper, for attachment to the undergarment, or they may be attached by mechanical attachments such as a hook and loop assembly, clasp assembly, hinge assembly or by combinations thereof. The cuffs and tabs or wings may also contain additional materials to make them thick and cushioning and may also contain, separately or additionally, flexible, stretchable or elastic materials. Such materials have the effect, on the cuffs and tabs or wings, and at times on the napkin itself, of gathering, curving or causing to them to conform to the body and the garment. Embodiments of cuffs and tabs or wings such as are described herein, and which are incorporated herein in their entirety are described in the following commonly assigned US Patents and Patent Applications: US Patent No. 4,940,462 to Salerno, "Sanitary Napkin with Expandable Flaps"; US Patent No. 5,490,847 to Correa et al; "Disposable Sanitary Napkin", US Patent No. 4,900,320 to McCoy, "Sanitary Napkin with Panty Gathering Flaps"; US Patent Application, Serial No. 08/198,809 to McCoy; "Body Conforming Absorbent Article"; US Patent Article Having Preformed Compliant Cuffs; US Patent Application, Serial No. 08/552,876 to Salerno et al, "Absorbent Article Having Compliant Cuffs"; and US Patent Application, Serial No. 08/552,881 to Salerno et al, "Stabilized Absorbent Article".

Fig. 18 shows a perspective view of an absorbent product of this invention, here a sanitary napkin 160 covered by a liquid permeable body facing layer 132, a liquid impermeable garment facing layer 134 and an absorbent structure (not shown; therebetween, defining an absorbent element 135, where body facing layer 132 and/or garment facing layer 134 may be made of, for example, a nonwoven fabric or perforated film or combinations thereof, as described above. Napkin 160 also comprises right and left longitudinally extending cuffs 136, 137 each of cuffs 136, 137 being attached along their respective base portions 138, 139 to the right and left longitudinal sides 140, 141 of napkin 160, respectively, such that the distal ends 142, 143 of cuffs 136, 137 extend outward from right and left longitudinal sides

140, 141 of napkin 160. Body facing layer 132 and garment facing layer 134 are attached to each other in a flange seal 144 and to base portions 138, 139 of cuffs 136, 137. Cuffs 136, 137 may be optionally longitudinally attached along their respective base portions 138, 139 to napkin 160, in such fashion that ensures that cuffs 136, 137 extend outward at least from longitudinal sides 140, 141, the attachment being: anywhere, between the respective longitudinal sides 140, 141 and the longitudinal centerline 145, along and above or below body facing layer 132, but not including longitudinal centerline 145; along and above or below garment facing layer 133, including longitudinal centerline 145. Cuffs 136, 137 in this example may also be covered with permeable, non permeable materials or combinations thereof, examples of such materials having been listed above as possible components of the body facing and garment facing layers. Cuffs 136, 137 may additionally be made of or contain in or on the cuffs other materials such as films, nonwovens and foam, the nonwoven or foam being preferably of highloft materials which are valued for their cushioning property. Cuffs 136, 137 may also additionally contain elastic materials in or on the cuffs, the elastic materials being either tensioned or nontensioned. Absorbent element 135 of this invention also comprises end regions 146, 147, each having a conforming means 155, 156, respectively consisting of a stiffened element 148, 149, in the form of a resin containing absorbent structure, and an unstiffened region 150, 151; and a central region 152 having a stiffening means in the form of two embossed channels 153, 154. Absorbent element 135 in Fig. 18 has a roughly rectangular outline, and is thicker in central region 152 than in the region immediately adjacent longitudinal sides 140, 141 or than in end regions 146, 147. Absorbent element 135 may have other outline shapes such as hourglass, dogbone or oval. The absorbent structure may further comprise a transfer layer of a low density nonwoven material, an auxiliary absorbent layer containing sphagnum moss and a main absorbent layer such as of airlaid pulp. Napkin 160 also comprises positioning adhesive (not shown), on the garment side of garment facing layer 134, for attaching napkin 160 to an undergarment, the positioning adhesive being protected until use by a release paper (not shown). The absorbent core may optionally contain as distinct layers, gradients, or as homogeneous dispersions, any or all of tissue, sphagnum moss and superabsorbent.

Fig. 19 shows a perspective view of an hourglass shaped 192 absorbent product of this invention, here a sanitary napkin 170 covered by a liquid permeable body facing layer 132, a liquid impermeable garment facing layer 134 and an absorbent structure (not shown) therebetween, defining an absorbent element 135, where body facing layer 132 and/or garment facing layer 134 may be made of, for example, a nonwoven fabric or perforated film or combinations thereof, as described above. Napkin 170 also comprise right and left longitudinally extending wings or tabs 161, 162 each of the wings or tabs 161, 162 being attached along their respective base portions 163, 164 to the right and left longitudinal edges 165, 166 of absorbent element 135, respectively, such that distal ends 167, 168 of wings or tabs 161, 162, extend outward from the right and left longitudinal edges 165, 166 of absorbent element 135. Body facing layer 132 and garment facing layer 134 are attached to each other in a flange seal 169 and to the base portions of wings or tabs 161, 162. Wings or tabs 161, 162, in this example, may also be covered with permeable, non permeable materials or combinations thereof, examples of such materials having been listed above as possible components of the body facing and garment facing layers. The wings or tabs can optionally be attached to the sanitary napkin: longitudinally along and above or below the cover between and including the center of the napkin and adjacent the lateral sides; longitudinally anywhere along the lateral sides of the napkin; and longitudinally along and above or below the barrier film backsheet. Wings or tabs 161, 162 may be longitudinally attached, alternatively along their respective base portions 163, 164 anywhere, between the respective lateral sides 137, 138 and adjacent to but not including the longitudinal centerline 145; such that wings or tabs 161, 162 extend outward at least from longitudinal edges 165, 166. Absorbent element 135 of this invention also comprises end regions 171, 172, each having a conforming means 173, 174, respectively consisting of a stiffened element 175, 176, in the form of an additional reinforcing strip, and an unstiffened region 177, 178; and a central region 179 having a stiffening means in the form of two embossed channels 190, 191. Absorbent element 135 in Fig. 19 has an hourglass outline 192 and has the same thickness in central region 193, the absorbent regions immediately adjacent right and left longitudinal edges 165, 166 and transverse edges 194, 195. Absorbent element 135 may have other outline shapes such as rectangular, dogbone or oval. The absorbent structure may further comprise a transfer layer of a low density nonwoven material, an auxiliary absorbent layer containing sphagnum moss and a main absorbent layer such as of airlaid pulp. Napkin 170, as well as tabs or wings 161, 162, also comprise positioning adhesive (not shown), on their garment facing sides, for attaching napkin 170 and tabs or wings 161, 162, to an undergarment, positioning adhesive being protected until use by a release paper (not shown). Absorbent core may optionally contain as distinct layers, gradients, or as homogeneous dispersions, any or all of tissue, sphagnum moss and superabsorbent.

Fig. 20 shows a perspective view of a rectangular shaped absorbent product of this invention, here a sanitary napkin 200 covered by a liquid permeable body facing layer 132, a liquid impermeable garment facing layer 134 and an absorbent structure (not shown) therebetween, defining an absorbent element 135, where

body facing layer 132 and/or garment facing layer 134 may be made of, for example, a nonwoven fabric or perforated film or combinations thereof, as described above. Body facing layer 132 and garment facing layer 134 are attached to each other in a flange seal 220. Napkin 200 also comprises right and left longitudinally extending wings or tabs 201, 202 each of the wings or tabs 201, 202 being attached along their respective base portions 203 (shown in phantom), 204 to garment facing layer 134 inwardly of longitudinal edges 205, 206 of absorbent element 135, respectively, such that the distal ends 207, 208 of wings or tabs 201, 202, may extend outward from the right and left longitudinal edges 205, 206 of absorbent element 135, such wings or tabs being particularly useful as panty gathering flaps as is described in previously cited, US Patent No. 4,900,320 to McCoy, "Sanitary Napkin with Panty Gathering Flaps". Wings or tabs 201, 202, in this example, may also be covered with permeable, non permeable materials or combinations thereof, examples of such materials having been listed above as possible components of the body facing and garment facing layers. Absorbent element 135 of this invention also comprises end regions 209, 210, each having a conforming means 211, 212, respectively consisting of a stiffened element 213, 214, in the form of a densified region, and an unstiffened region 215, 216; and a central region 217 having a stiffening means in the form of two embossed channels 218, 219. Absorbent element 135 in Fig. 20 has an rectangular outline and is thicker in central region 217 than in the absorbent regions immediately adjacent longitudinal edges 205, 206 or than end regions 209, 210. Absorbent element 135 may have other outline shapes such as hourglass, dogbone or oval. The absorbent structure may further comprise a transfer layer of a low density nonwoven material, an auxiliary absorbent layer containing sphagnum moss and a main absorbent layer such as of airlaid pulp. Napkin 200, as well as tabs or wings 201, 202, also comprise positioning adhesive (not shown), on their garment facing sides, for attaching napkin 200, and tabs or wings 201, 202, to an undergarment, positioning adhesive being protected until use by a release paper (not shown). Absorbent core may optionally contain as distinct layers, gradients, or as homogeneous dispersions, any or all of tissue, sphagnum moss and superabsorbent.

Fig. 21 shows a perspective view of an absorbent product of this invention, here a sanitary napkin 250 covered by a liquid permeable body facing layer 132, a liquid impermeable garment facing layer 134 and an absorbent structure (not shown) therebetween, defining an absorbent element 135, where body facing layer 132 and/or garment facing layer 134 may be made of, for example, a nonwoven fabric or perforated film or combinations thereof, as described above. Body facing layer 132 and garment facing layer 134 are attached to each other in a flange seal 235. Napkin 250 also comprises

right and left longitudinally extending cuffs 221, 222 each of the cuffs being attached along their respective base portions 223, 224 to the right and left longitudinal edges 225, 226 of napkin 250, respectively, such that the distal ends 227, 228 of cuffs 221, 222 extend outward from right and left longitudinal edges 225, 226 of napkin 250. Additionally, napkin 250 comprises right and left longitudinally extending wings or tabs 229, 230 each of the wings or tabs 229, 230 being attached along their respective base portions 231 (shown in phantom), 232 to garment facing layer 134 inwardly of longitudinal edges 225, 226 of absorbent element 135, respectively, such that the distal ends 233, 234 of wings or tabs 229, 230 may extend outward from the right and left longitudinal edges 225, 226 of absorbent element 135, such wings or tabs being particularly useful as panty gathering flaps as is described in previously cited, US Patent No. 4,900,320 to McCoy, "Sanitary Napkin with Panty Gathering Flaps". Wings or tabs 229, 230, in this example, may also be covered with permeable, non permeable materials or combinations thereof, examples of such materials having been listed above as possible components of the body facing and garment facing layers. Absorbent element 135 of this invention also comprises end regions 236, 237 each having a conforming means 245, 246, respectively consisting of a stiffened element 238, 239 and an unstiffened region 240, 241; and a central region 242 having a stiffening means in the form of two co-joined embossed channels 243, 244. Absorbent element 135 in Fig. 21 has a rectangular outline and is of approximately equal thickness in central region 241, the absorbent regions immediately adjacent longitudinal edges 225, 226 and end regions 236, 237. Absorbent element 135 may have other outline shapes such as hourglass, dogbone or oval. The absorbent structure may further comprise a transfer layer of a low density nonwoven material, an auxiliary absorbent layer containing sphagnum moss and a main absorbent layer such as of airlaid pulp. Napkin 250, as well as wings or tabs 229, 230, also comprise positioning adhesive (not shown), on their garment facing sides, for attaching napkin 250, and wings or tabs 229, 230, to an undergarment, positioning adhesive being protected until use by a release paper (not shown). Absorbent core may optionally contain as distinct layers, gradients, or as homogeneous dispersions, any or all of tissue, sphagnum moss and superabsorbent.

#### Measuring Bending Resistance

The effect of the conforming means and its stiffened element on the bending resistance of a napkin of this invention, along axes perpendicular and parallel to the central longitudinal axis in the end region of the absorbent element, was measured with a Thwing-Albert PCA Score Bend Tester, Model No. 202-100-4. Comparison was made with analogous bending resistances obtained on napkins not having the conforming means

of this invention. Bending resistances were measured as follows: A napkin was clamped vertically between two clamping plates, a rear plate and a front plate, the front plate having a straight edge plate over which the napkin will be bent. A bending plate, behind the portion of the napkin that extends above the clamping plates and about 5 mm above the napkin's clamped section, is rotated forwardly, through an angle of 60°, to bend the napkin over the straight edge plate. The peak force exerted by the bending plate through a one inch force, normalized per centimeter of bending axis over which the absorbent element that contains absorbent structure is bent, is referred to as the "bending resistance".

Fig. 22 shows a napkin 280 of this invention, having stiffened elements 261, 262, here embossed channels, in end regions 263, 264 respectively; on which such bending resistance measurements were made; and where similar results may be also be obtained for other types of stiffened elements lasted in the description of this invention. Reference herein will be made to end region 263 and its stiffened element embossed channel 261, which in turn has a transverse component 266 and left and right perpendicular components 267, 268. Bending resistances were measured along three bending axes, X1 to X3, perpendicular to a central longitudinal axis 265, and along five bending axes, L1 to L5, parallel to central longitudinal axis 265, where the end region being measured was cut from the napkin. Identical napkins, without embossed channels, were similarly measured for comparison.

Fig. 23, with reference to Fig. 22, shows the bending resistances measured along the three bending axes, X1 to X3, perpendicular to central longitudinal axis 265, the error bars being standard deviations of five measurements. Axis X1 coincides with transverse component 266 of the channel, axis X3 is between the proximal distal edge 269 of the center region 270 of napkin 280 and embossed channel 261, and axis X2 coincides with a section of the napkin where the channel has perpendicular components 267, 268. Bending resistance increases at X2, but does not change significantly at X1 and X3. Thus, X1 and X3 provide hinge points.

Fig. 24, with reference to Fig. 22, shows the bending resistances measured along the five bending axes, L1 to L5, perpendicular to central longitudinal axis 265, the error bars being the standard deviations of the five measurements. Along the central three of these axes (L2-L4) bending resistance is increased, thereby providing increased bunching resistance along these axes and favoring bending along the axes X1 and X3. Axis X2 would also be a favored bending axis if the embossed channel had no perpendicular components 267, 268. At the end of transverse component 266 and where in this example axes L1 and L5 coincide with perpendicular components 267, 268 bending resistance is does not increase. However, bunching resistance of the napkin is not appreciably affected since these sections are close to the edges of the pad.

## Claims

1. An absorbent product (30) used by a woman for feminine hygiene comprising a liquid permeable body facing layer (2), a liquid impermeable garment facing layer (4), an absorbent structure therebetween defining an absorbent element (6) having:

longitudinal edges (8, 10) opposite each other defining a width dimension, a central longitudinal axis (11) parallel to the longitudinal edges (8, 10), transverse edges (12, 14) opposite each other defining a length dimension;

a central region (18) having first and second distal ends (19, 20) opposite each other defining a length that is sufficient to cover the woman's labia majora in use;

a first end region (22), extending from the first distal end (19) of the central region (18) and being adapted to cover at least a portion of the woman's mons pubis in use;

a second end region (24), extending from the second distal end (20) of the central region (18) and being adapted to cover at least a portion of the woman's posterior perineum in use; and

at least one conforming means (31, 32), contained within at least one end region (22, 24), comprising a non-stiffened region (27, 29) adjacent the distal end (19, 20) of the central region (18) and adjacent to a stiffened element (26, 28), the stiffened element (26, 28) being located inward of the transverse and longitudinal edges (12, 14; 8, 10) of absorbent element (6), the stiffened element (26, 28) extending transversely across the end region (22, 24) generally perpendicular to the central longitudinal axis of the absorbent element (6) and centrally occupying at least 50% of the width of the absorbent element (6);

wherein the absorbent product preferentially bends in the non-stiffened region (27, 29) and the stiffened element (26, 28) resists transverse bunching.

2. The absorbent product of claim 1, wherein the absorbent product is a sanitary napkin, panty liner, or an incontinence product.
3. The absorbent product of claim 1, wherein the stiffened element (26, 28) comprises at least one of an embossed channel (32), a densified region, a projection above the body facing layer (2), an additional material strip reinforcing at least the body fac-

ing layer (2), a resin containing region of the absorbent structure (7), a hotmelt containing region of the absorbent structure, or combinations thereof.

4. The absorbent product of claim 3, wherein the embossed channel (38) is impressed into the absorbent structure. 5
5. The absorbent product of claim 3, wherein the embossed channel (38) is impressed downward into the body facing permeable layer (2) and the absorbent structure (7) beneath. 10
6. The absorbent product of claim 3, wherein the embossed channel is impressed upward into the garment facing layer and the absorbent structure above. 15
7. The absorbent product of claim 3, wherein the embossed channel (36) is impressed downward into the body facing layer (2), the absorbent structure (6) and the garment facing layer (4) beneath. 20
8. The absorbent product of claim 7, wherein the embossed channel (38) protrudes beyond the garment facing layer (4). 25
9. The absorbent product of claim 3, wherein the embossed channel (34) is impressed upward into the garment facing layer (4), the absorbent structure (7) and the body facing layer (2) above. 30
10. The absorbent product of claim 9, wherein the embossed channel (42) protrudes beyond the body facing layer (2). 35
11. The absorbent product of claim 3, having at least one embossed channel (48) impressed downward into the body facing layer (2) and the absorbent structure (6) beneath and at least one embossed channel (50) impressed upward into the garment facing layer (4) and the absorbent structure (6) above. 40
12. The absorbent product of claim 1, wherein the length dimension is in the approximate range of between 101.6 and 330.2 mm (4 and 13 inches), the width dimension is in the approximate range of between 38.1 and 101.6 mm (0.05 and one inch). 45
13. The absorbent product of claim 1, wherein the stiffened element is located approximately between 3.175 mm (0.125 inches) and 63.5 mm (2.5 inches) inwardly of the edges of the end region. 50
14. The absorbent product of claim 1, wherein the stiffened element (54, 56) comprises a lateral component (64, 65) located transversely across the end

region (58, 62) and additionally at least one generally perpendicular component (66, 67, 68, 69) that is generally orthogonal to the lateral component (64, 65) and generally parallel to the central longitudinal axis (72) of the absorbent product (80), and is closer to the longitudinal edge (74, 76) than it is to the central longitudinal axis (72).

15. The absorbent product of claim 1, wherein the stiffened element is of continuous segments, discontinuous segments, straight segments, curved segments or combination thereof.
16. The absorbent product of claim 1, which is of generally rectangular shape in the plan view, and wherein the longitudinal edges are generally parallel to and equidistant from each other.
17. The absorbent product of claim 1, wherein at least part of the center region has a width that is smaller than the transverse width of at least one of the end regions.
18. The absorbent product of claim 1, which additionally has at least one garment attaching tab which is attached to one of the longitudinal edges of the absorbent element.
19. The absorbent product of claim 1, which additionally has at least one garment attaching tab which is attached inwardly of one of the longitudinal edges of the absorbent element.
20. The absorbent product of claim 1, which additionally has at least one cuff (136, 137) which is attached to one of the longitudinal edges (140, 141) of the absorbent element (160).
21. The absorbent product of claim 1, which additionally has at least one cuff (136, 137) which is attached to one of the longitudinal edges (140, 141) of the absorbent element (160) and at least one garment attaching tab (161, 162) which is attached inwardly of one of the longitudinal edges (165, 166) of the absorbent element (135).
22. The absorbent product of claim 1, wherein the absorbent structure is thicker in the central region (152) than it is in the end regions (146, 147).
23. The absorbent product of claim 1, wherein the absorbent structure is comprised of an absorbent core.
24. The absorbent product of claim 1, wherein the absorbent structure is comprised of a transfer layer and an absorbent core.

25. The absorbent product of claim 23, or claim 24, wherein the material comprising the absorbent core is selected from the group consisting of woodpulp, tissue, synthetic fibers treated to make them hydrophilic, hydrophobic synthetic fibers in mixtures of hydrophilic fibers, sphagnum moss, superabsorbent particles, superabsorbent fibers and combination thereof.
26. An absorbent product used by a woman for feminine hygiene comprising a liquid permeable body facing layer, a liquid impermeable garment facing layer, an absorbent structure therebetween defining an absorbent element having:
- longitudinal edges opposite each other defining a width dimension, a central longitudinal axis parallel to the longitudinal edges, transverse edges opposite each other defining a length dimension;
  - a central region having first and second distal ends opposite each other defining a length that is sufficient to cover the woman's labia majora in use;
  - a first end region, extending from the first distal end of the central region and being adapted to cover at least a portion of the woman's mons pubis in use;
  - a second end region, extending from the second distal end of the central region and being adapted to cover at least a portion of the woman's posterior perineum in use; at least one conforming means, contained within at least one end region, comprising a nonstiffened region adjacent the distal end of the central region and adjacent to a stiffened element, the stiffened element being located inward of the transverse and longitudinal edges of the absorbent element, the stiffened element extending transversely across the end region generally perpendicular to the central longitudinal axis of the absorbent element and centrally occupying at least 50% of the width of the absorbent element; and
  - at least one stiffening means in the center region spaced apart from the at least one stiffened element;
  - wherein the absorbent product preferentially bends in the non-stiffened region and the stiffening means resists transverse bunching; and wherein the stiffening means facilitates the ability of the absorbent product to resist longitudinal bending.
27. The absorbent product of claim 26, wherein the absorbent product is a sanitary napkin, panty liner, or an incontinence product.
28. The absorbent product of claim 26, wherein the stiffened element is at least one of an embossed channel, a densified region, a projection above the body facing layer, an additional material strip reinforcing at least the body facing layer, a resin containing region of the absorbent structure, a hotmelt containing region of the absorbent structure, or combinations thereof.
29. The absorbent product of Claim 28, wherein the embossed channel is impressed into the absorbent structure.
30. The absorbent product of Claim 28, wherein the embossed channel is impressed downward into the body facing layer and the absorbent structure beneath.
31. The absorbent product of Claim 28, wherein the embossed channel is impressed upward into the garment facing layer and the absorbent structure above.
32. The absorbent product of Claim 28, wherein the embossed channel is impressed downward into the body facing layer, the absorbent structure and the garment facing layer beneath.
33. The absorbent product of Claim 32, wherein the embossed channel protrudes beyond the garment facing layer.
34. The absorbent product of Claim 28, wherein the embossed channel is impressed upward into the garment facing layer, the absorbent structure and the body facing layer above.
35. The absorbent product of Claim 34, wherein the embossed channel protrudes beyond the body facing layer.
36. The absorbent product of Claim 28, having at least one embossed channel impressed downward into the body facing layer and the absorbent structure beneath and at least one embossed channel impressed upward into the garment facing layer and the absorbent structure above.
37. The absorbent product of claim 26, wherein the length dimension is in the approximate range of between 101.6 and 330.2 mm (4 and 13 inches), the width dimension is in the approximate range of between 38.1 and 101.6 mm (1.5 and 4 inches); and where the absorbent product has a thickness

- dimension which is in the approximate range of between 1.27 and 25.4 mm (0.005 and one inch).
38. The absorbent product of claim 26, wherein the stiffened element is located approximately between 3.175 mm (0.125 inches) and 69.5 mm (2.5 inches) inwardly of the edges of the end region. 5
39. The absorbent product of claim 26, wherein the stiffened element comprises a lateral component located transversely across the end region and additionally at least one generally perpendicular component, that is generally orthogonal to the lateral component and generally parallel to the central longitudinal axis of the absorbent product, and is closer to the longitudinal edge than it is to the central longitudinal axis. 10 15
40. The absorbent product of claim 26, wherein the stiffened element is of continuous segments, discontinuous segments, straight segments, curved segments or combination thereof. 20
41. The absorbent product of claim 26, which is of generally rectangular shape in the plan view, and wherein the longitudinal edges are generally parallel to and equidistant from each other. 25
42. The absorbent product of claim 26, wherein at least part of the center region has a width that is smaller than the transverse width of at least one of the end regions. 30
43. The absorbent product of claim 26, which additionally has at least one garment attaching tab which is attached to one of the longitudinal edges of the absorbent element. 35
44. The absorbent product of claim 26, which additionally has at least one garment attaching tab which is attached inwardly of one of the longitudinal edges of the absorbent element. 40
45. The absorbent product of claim 26, which additionally has at least one cuff which is attached to one of the longitudinal edges of the absorbent element. 45
46. The absorbent product of claim 26, which additionally has at least one cuff which is attached to one of the longitudinal edges of the absorbent element and at least one garment attaching tab which is attached inwardly of one of the longitudinal edges of the absorbent element. 50
47. The absorbent product of claim 26, wherein the absorbent structure is thicker in the central region than it is in the end regions. 55
48. The absorbent product of claim 26, wherein the absorbent structure is comprised of an absorbent core.
49. The absorbent product of claim 26, wherein the absorbent structure is comprised of a transfer layer and an absorbent core.
50. The absorbent product of claim 48, or claim 49, wherein the material comprising the absorbent core is selected from the group consisting of woodpulp, tissue, synthetic fibers treated to make them hydrophilic, hydrophobic synthetic fibers in mixtures of hydrophilic fibers, sphagnum moss, superabsorbent particles, superabsorbent fibers and combination thereof.
51. The absorbent product of claim 26, wherein the stiffening means comprises at least one of an embossed channel, an extra thickness of absorbent material, a rigid insert, a semirigid insert or combinations thereof.
52. The absorbent product of claim 51, wherein the embossed channel is a longitudinal channel located between the central longitudinal axis and the longitudinal edge.
53. The absorbent product of claim 52, wherein the longitudinal channel is straight.
54. The absorbent product of claim 52, wherein the longitudinal channel is curved, curving outwardly from the longitudinal axis.
55. The absorbent product of claim 52, wherein the longitudinal channel is curved, curving inwardly toward the longitudinal axis.
56. The absorbent product of claim 51, wherein the semirigid insert contains sphagnum moss.
57. The absorbent product of claim 51, wherein the semirigid insert is a plastic sheet.
58. The absorbent product of claim 26, where the distance of the stiffened element to the longitudinal channel is greater than the distance of the stiffened element to any of the transverse and longitudinal edges adjacent the stiffened element.
59. An absorbent product used by a woman for feminine hygiene comprising a liquid permeable body facing layer, a liquid impermeable garment facing layer, an absorbent structure therebetween defining an absorbent element having:

longitudinal edges opposite each other defin-



ing, a width dimension, a central longitudinal axis parallel to the longitudinal edges, transverse edges opposite each other defining a length dimension;

a central region having first and second distal ends opposite each other defining a length that is sufficient to cover the woman's labia majora in use;

a first end region, extending from the first distal end of the central region and being adapted to cover at least a portion of the woman's mons pubis in use;

a second end region, extending from the second distal end of the central region and being adapted to cover at least a portion of the woman's posterior perineum in use; and

at least one conforming means, contained within at least one end region, comprising a nonstiffened region adjacent the distal end of the central region and adjacent to a stiffened element, the stiffened element being located inward of the transverse and longitudinal edges of the absorbent element, the stiffened element being a means for increasing the bending resistance of the absorbent element, parallel to the central longitudinal axis of the absorbent element along at least 50% of its central width, compared to the absence in the absorbent element of the stiffened element; and

wherein the nonstiffened region, in use, enables the absorbent product to bend and the stiffened element, in use, resists transverse bunching; and

wherein the conforming means contains at least one axis, perpendicular to the central longitudinal axis, and the bending resistance of the absorbent element along the at least one axis is not greater compared to the absence in the absorbent element of the conforming means.

60. The absorbent product of claim 59, wherein the absorbent product is a sanitary napkin, panty liner, or an incontinence product.

61. The absorbent product of Claim 59, wherein the increased bending resistance of the absorbent element parallel to the central longitudinal axis is at least 20%.

62. The absorbent product of claim 59, wherein the stiffened element is at least one of an embossed

channel, a densified region, a projection above the body facing layer, an additional material strip reinforcing at least the body facing layer, a resin containing region of the absorbent structure, a hotmelt containing region of the absorbent structure, or combinations thereof.

63. The absorbent product of Claim 62, wherein the embossed channel is impressed into the absorbent structure.

64. The absorbent product of Claim 62, wherein the embossed channel is impressed downward into the body facing layer and the absorbent structure beneath.

65. The absorbent product of Claim 62, wherein the embossed channel is impressed upward into the garment facing layer and the absorbent structure above.

66. The absorbent product of Claim 62, wherein the embossed channel is impressed downward into the body facing layer, the absorbent structure and the garment facing layer beneath.

67. The absorbent product of Claim 67, wherein the embossed channel protrudes beyond the garment facing layer.

68. The absorbent product of Claim 62, wherein the embossed channel is impressed upward into the garment facing layer, the absorbent structure and the body facing layer above.

69. The absorbent product of Claim 69, wherein the embossed channel protrudes beyond the body facing layer.

70. The absorbent product of Claim 62, having at least one embossed channel impressed downward into the body facing layer and the absorbent structure beneath and at least one embossed channel impressed upward into the garment facing layer and the absorbent structure above.

71. The absorbent product of claim 59, wherein the length dimension is in the approximate range of between 101.6 and 330.2 mm (4 and 13 inches), the width dimension is in the approximate range of between 38.1 and 101.6 mm (1.5 and 4 inches); and where the absorbent product has a thickness dimension which is in the approximate range of between 1.27 and 25.4 mm (0.05 and one inch).

72. The absorbent product of claim 59, wherein the stiffened element is located approximately between 3.175 mm (0.125 inches) and 63.5 mm (2.5 inches)

inwardly of the edges of the end region.

73. The absorbent product of claim 59, wherein the stiffened element comprises a lateral component located transversely across the end region and additionally at least one generally perpendicular component, that is generally orthogonal to the lateral component and generally parallel to the central longitudinal axis of the absorbent product, and is closer to the longitudinal edge than it is to the central longitudinal axis.

74. The absorbent product of claim 59, wherein the stiffened element is of continuous segments, discontinuous segments, straight segments, curved segments or combination thereof.

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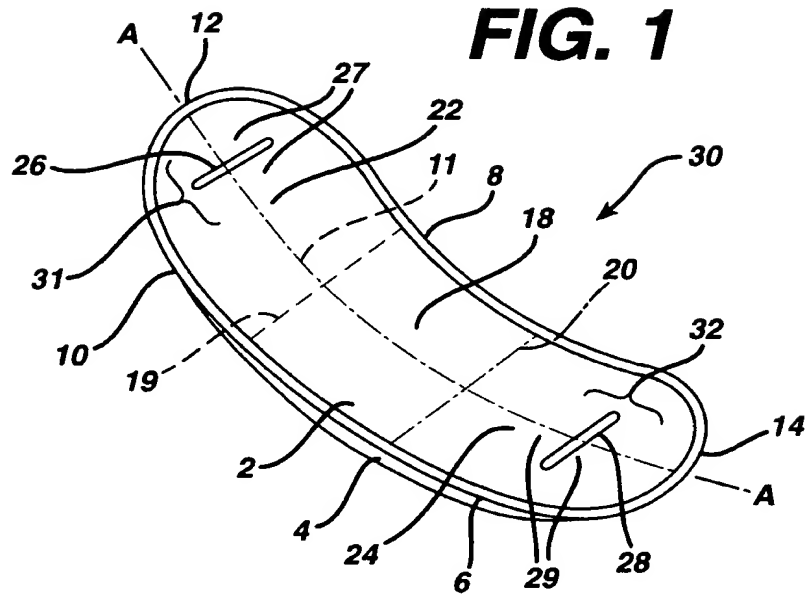
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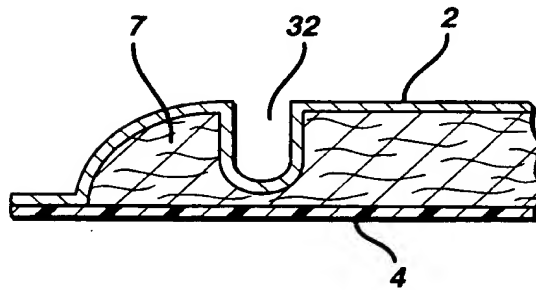
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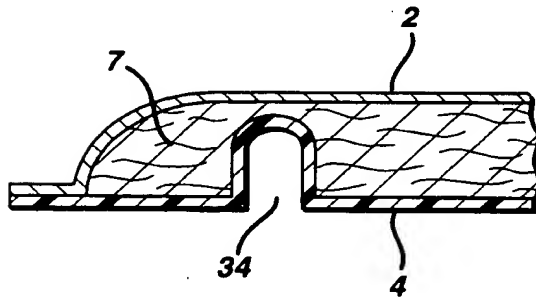
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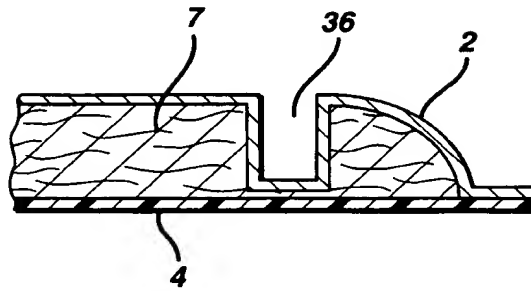
**FIG. 2**



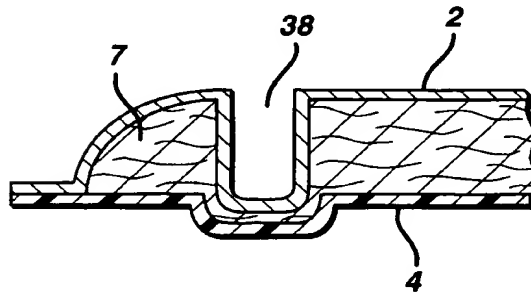
**FIG. 3**



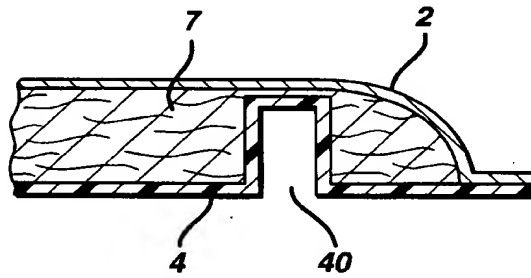
**FIG. 4**



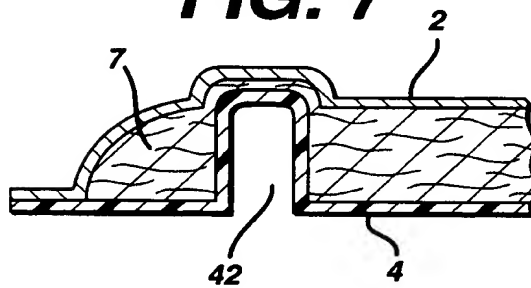
**FIG. 5**



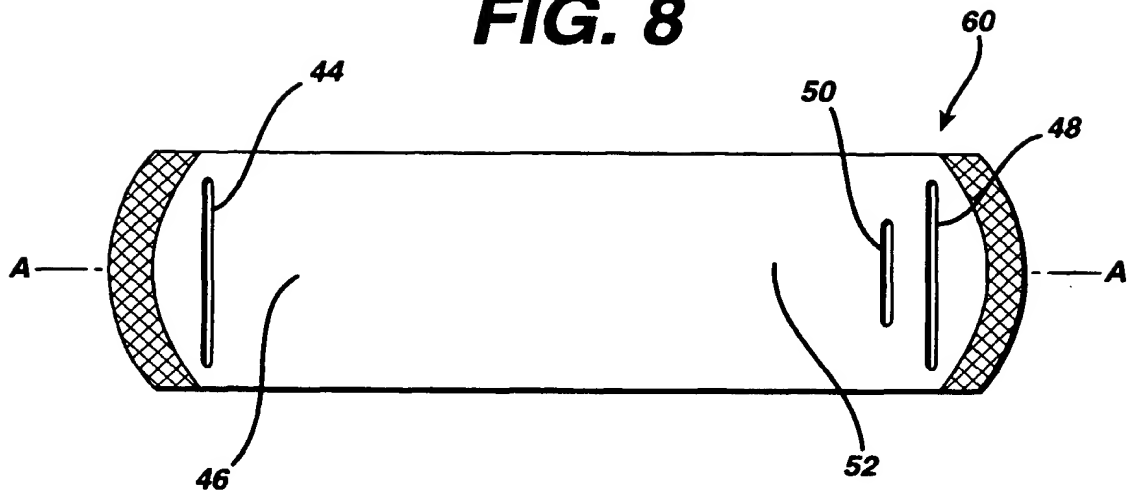
**FIG. 6**



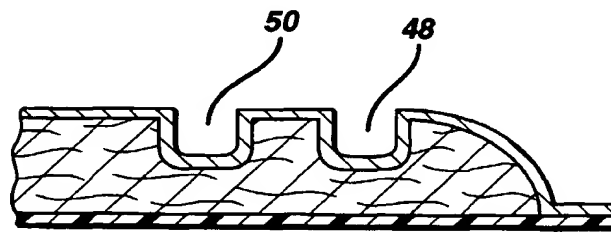
**FIG. 7**



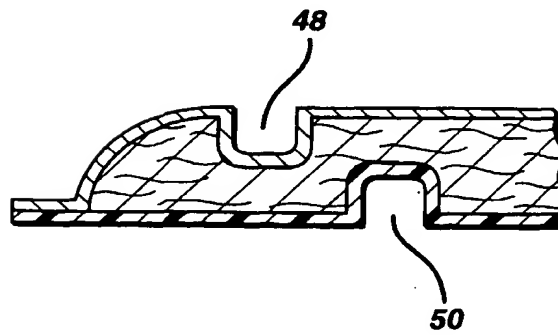
**FIG. 8**



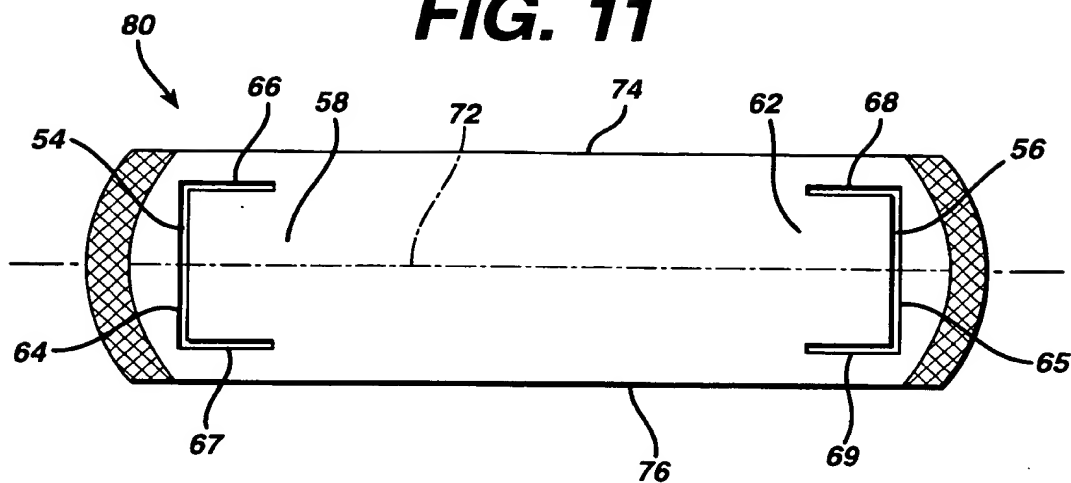
**FIG. 9**



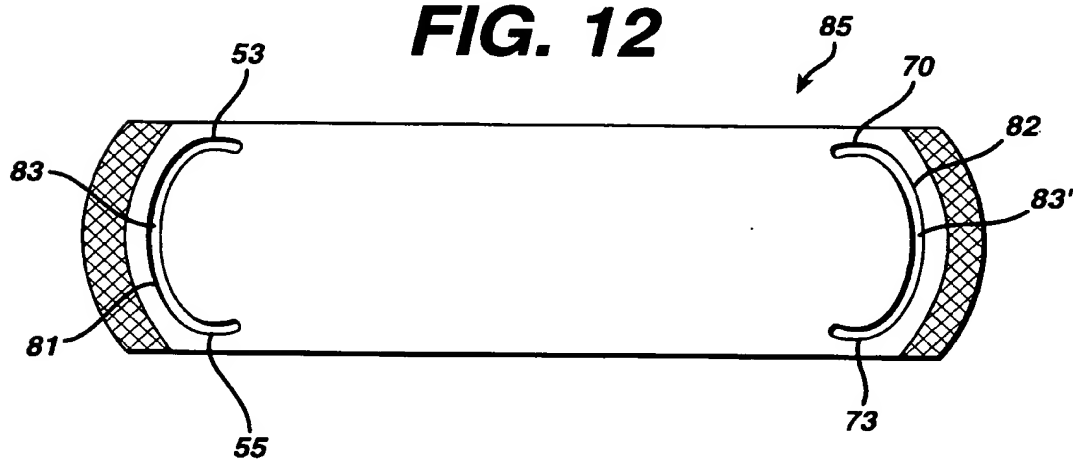
**FIG. 10**



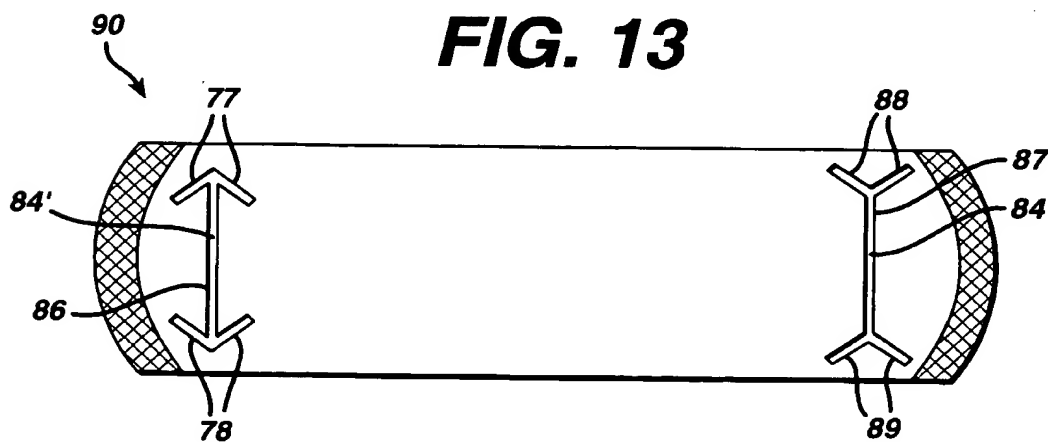
**FIG. 11**



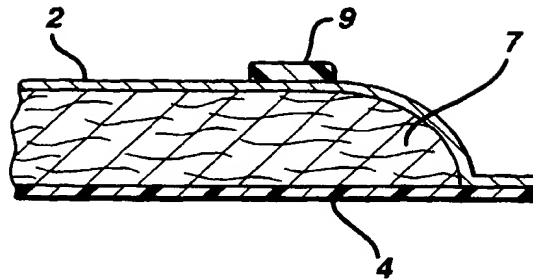
**FIG. 12**



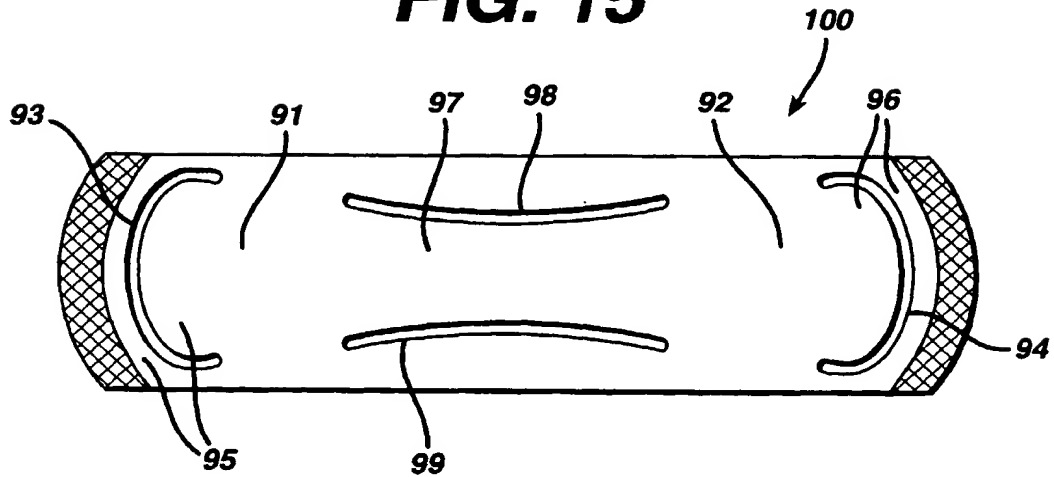
**FIG. 13**



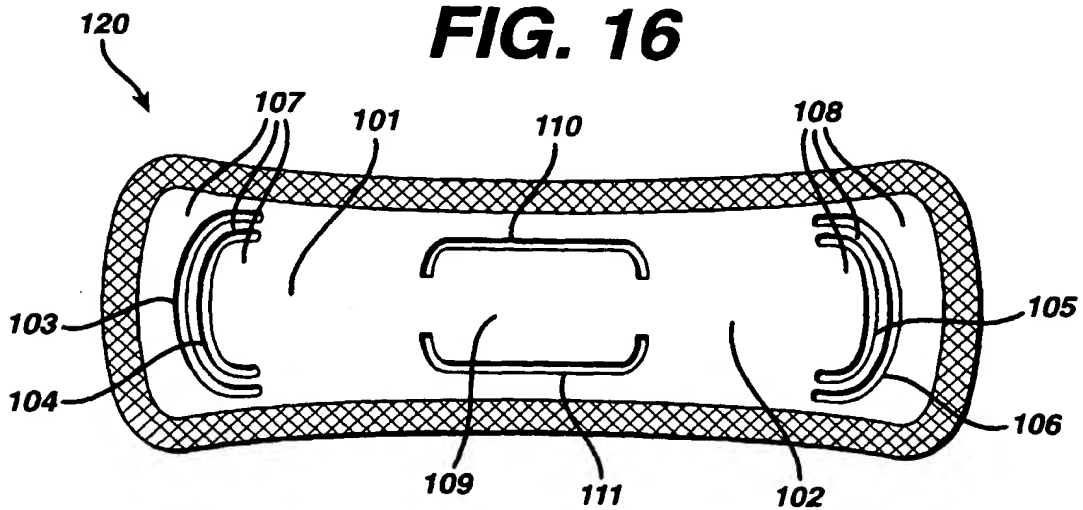
**FIG. 14**



**FIG. 15**

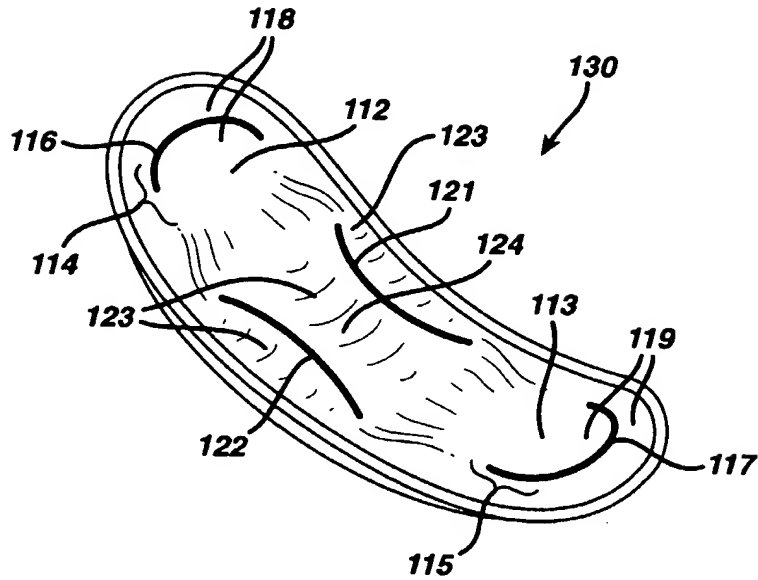


**FIG. 16**

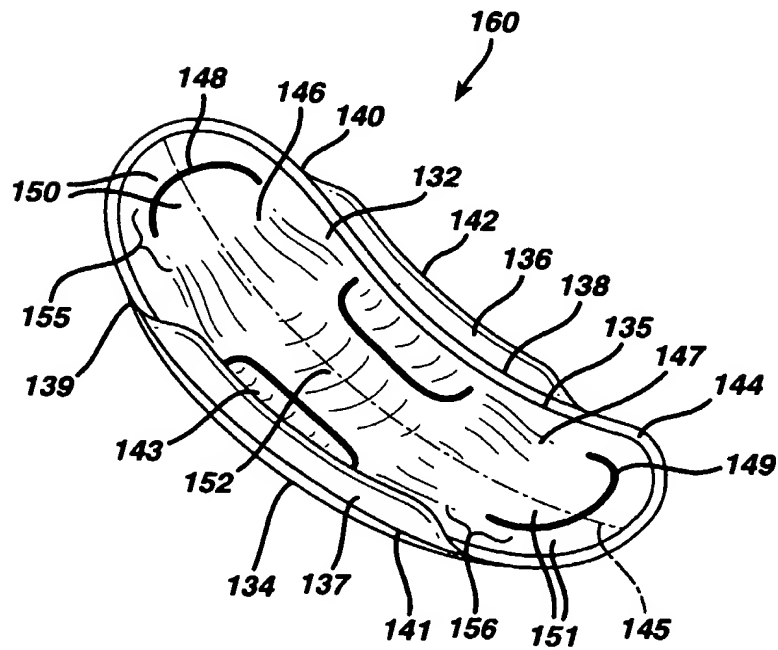




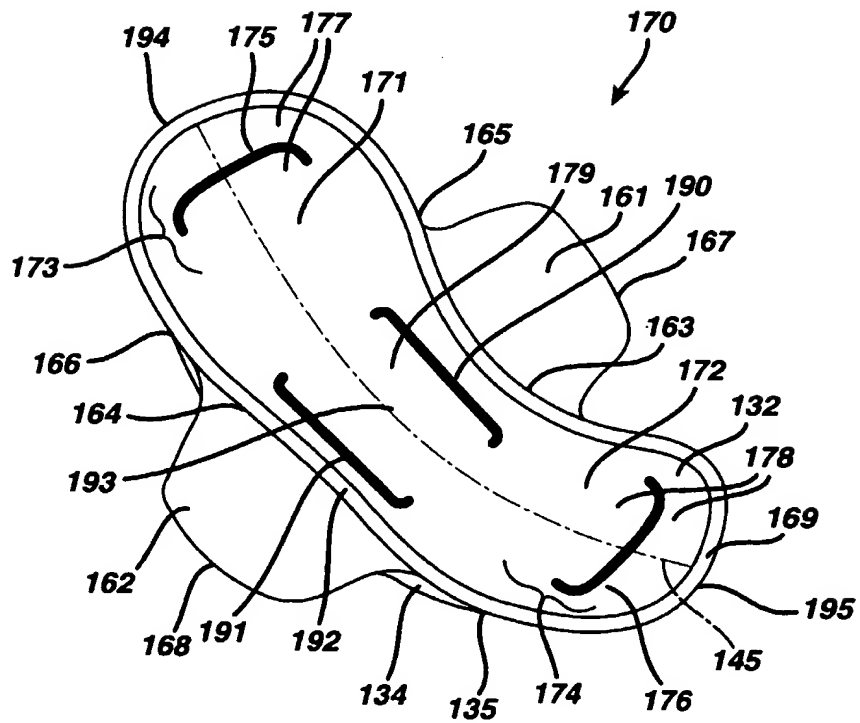
**FIG. 17**



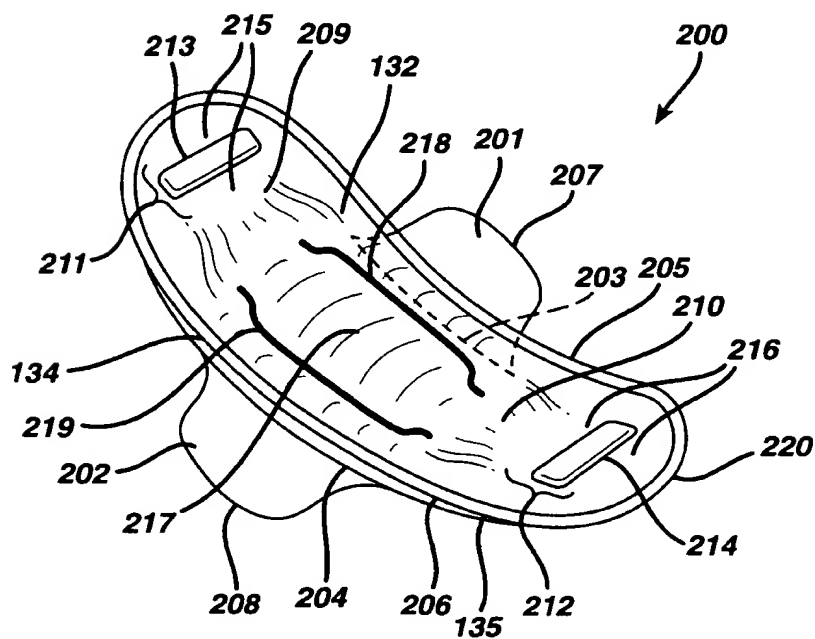
**FIG. 18**



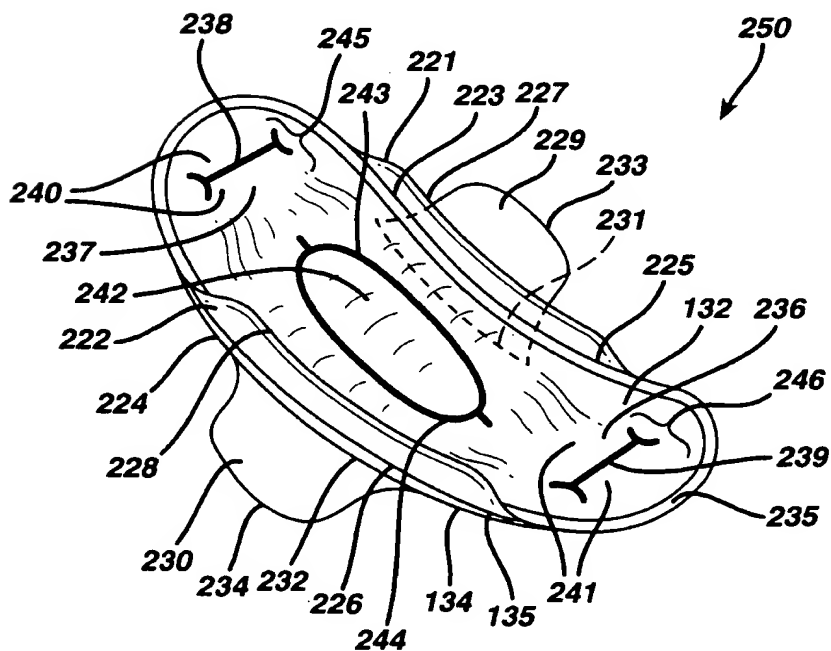
**FIG. 19**



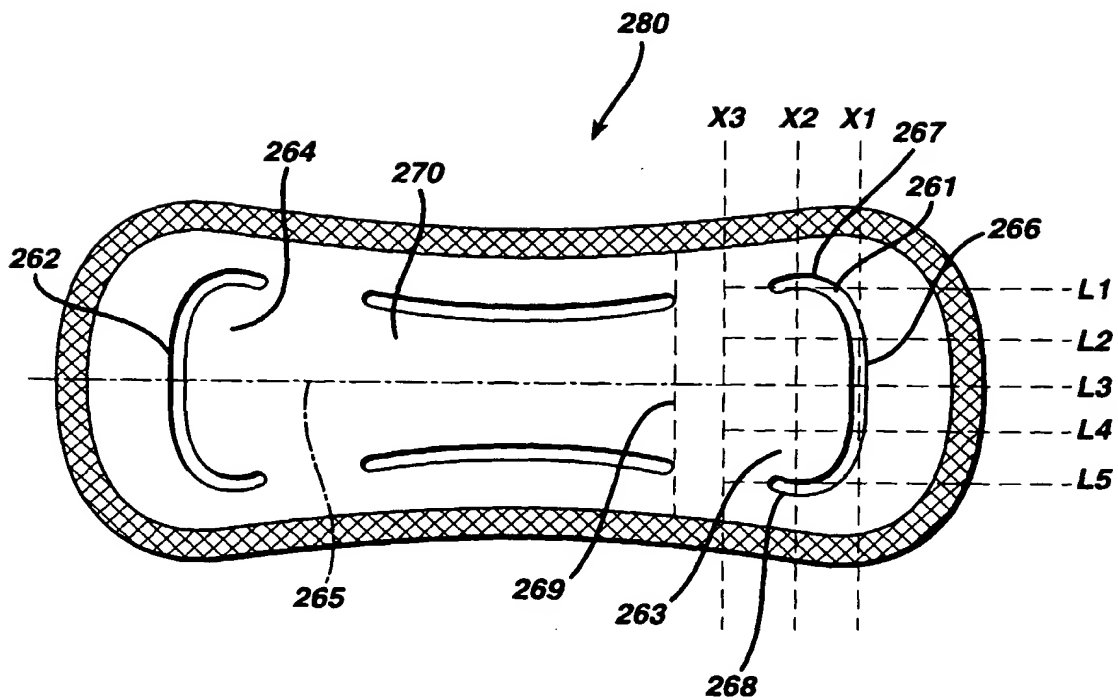
**FIG. 20**

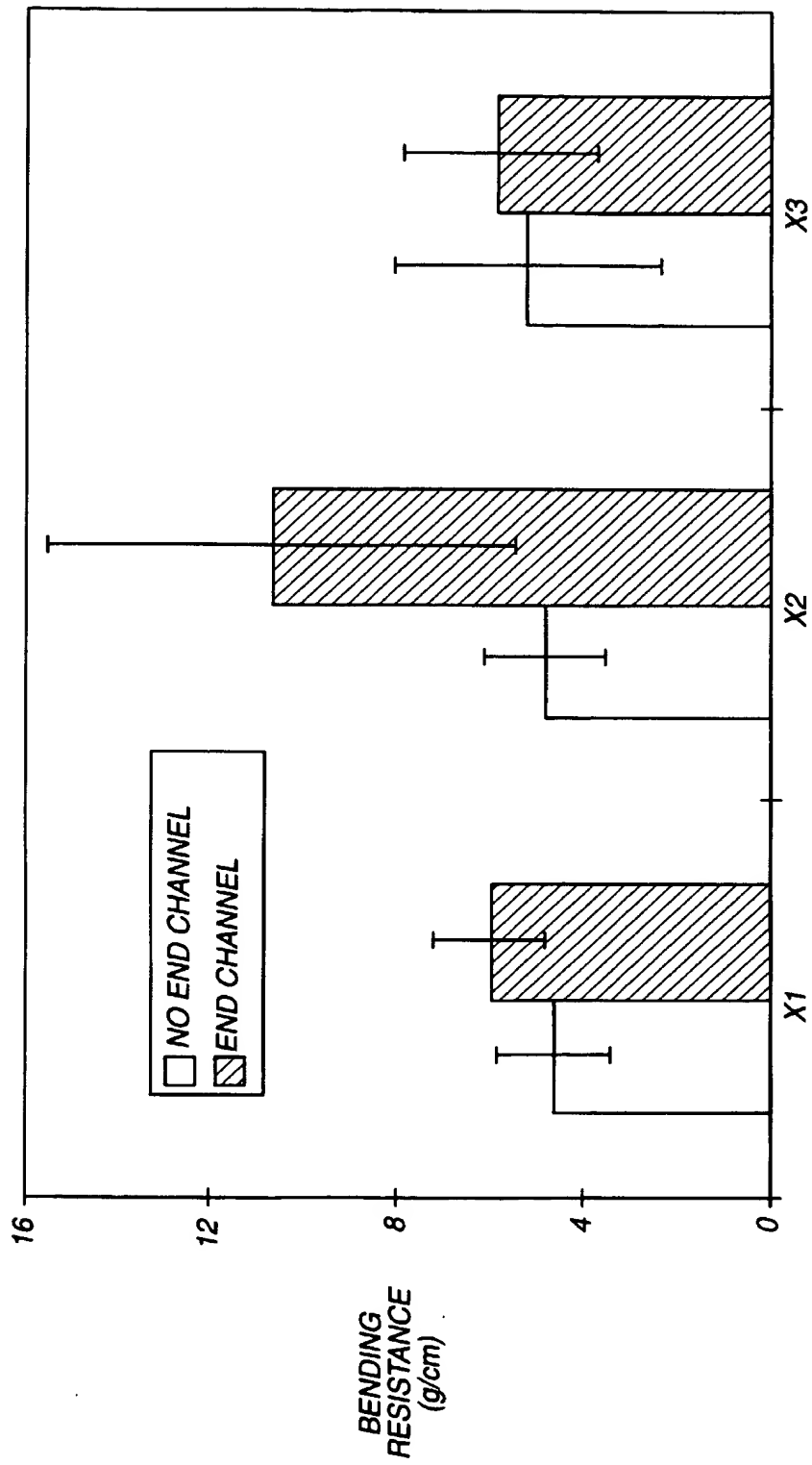


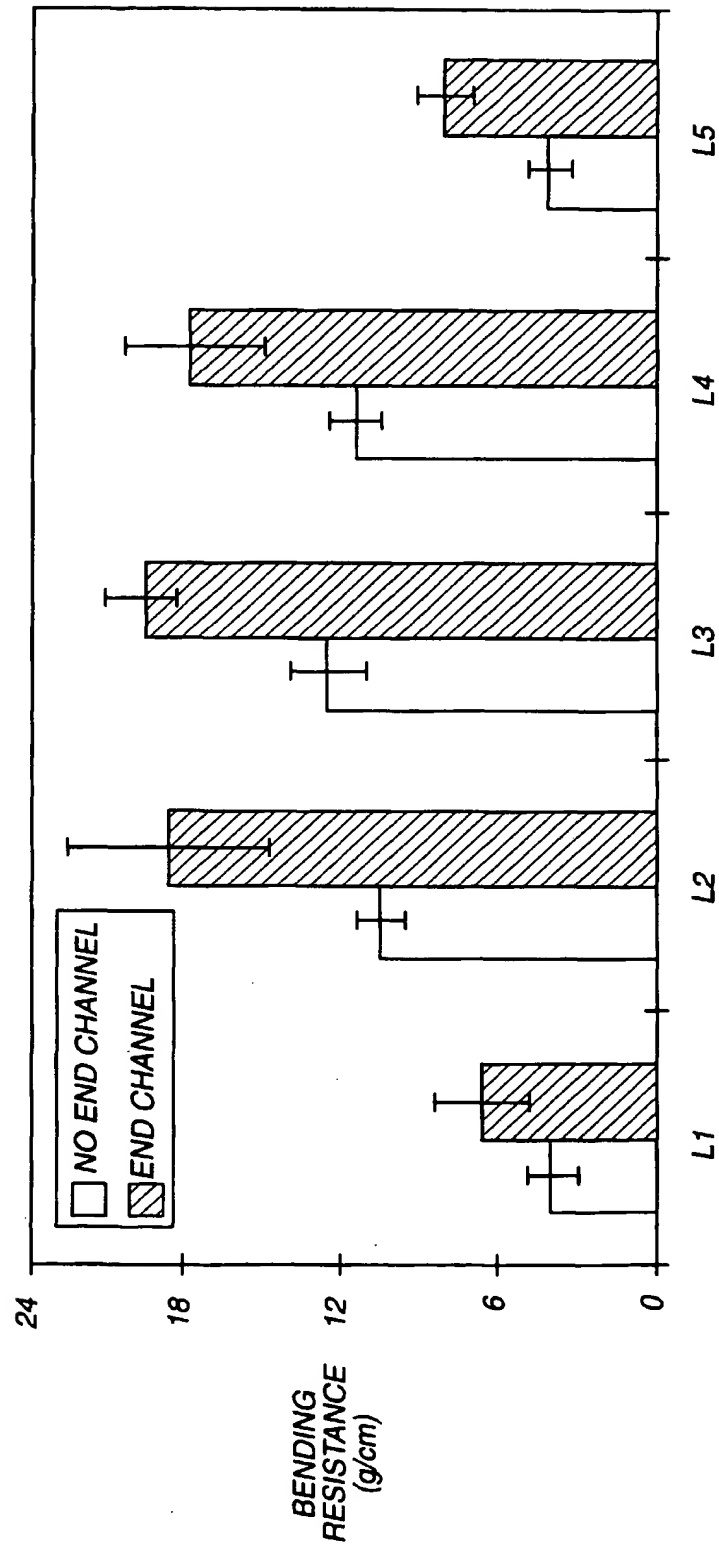
**FIG. 21**

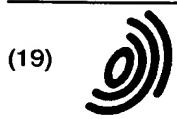


**FIG. 22**



**FIG. 23**

**FIG. 24**



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(11)

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(12)

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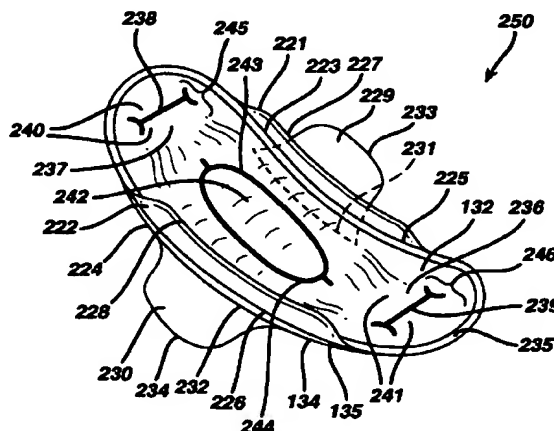
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### (54) Absorbent products having conforming means

(57) This invention provides protective products feminine hygiene absorbent such as sanitary napkins that have conforming means in their end regions that, in use, facilitate the products' ability to fit close and conform to the body, resist transverse bunching and prevent leakage of fluid from the edges. The conforming means (245, 246) consists of a stiffened element (238, 239) and a non-stiffened region (240, 241) immediately adjacent the stiffened element that cooperate to bend, fit and conform. The stiffened element, such as an embossed channel (243, 244) or regions that are stiff, densified or reinforced, bends along its axis of bending and resists bending and compression orthogonal to that axis. The non-stiffened relatively unconstrained region (240, 241) puffs outward to fit and conform to the body. The center region (242) of the napkin may optionally contain a stiffening means, such as extra absorbent material, a sphagnum moss containing insert and an embossed channel (243, 244); the stiffening means (243) of the center region (242) being spaced apart from the stiffened element (238, 239) of the end region (236, 237). The absorbent product may also optionally have cuffs, or optionally have undergarment wrapping wings (229, 230), where such cuffs or wings synergistically cooperate with the conforming means (245, 246) of this invention to provide full and reserve coverage of and conformability to the body. This is true for cuffs, and

especially for wings (229, 230), and most especially for wings that are attached inwardly of the longitudinal edges of the absorbent element (135), such wings providing gathering of the crotch of the undergarment without diminishing the strike zone that is available to capture body fluids.

FIG. 21



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# EUROPEAN SEARCH REPORT

Application Number  
EP 98 10 0166

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
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A	* page 7, line 19 - page 8, line 7; claims 1,5; figure 4 *	59,60, 62-64, 71,72,74	
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A	* claims; figures *	59,60, 62-64, 71-74	
<p>--- -/--</p>			
The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>25 January 2000</b>	Examiner <b>Mirza, A</b>
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p>		<p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons &amp; : member of the same patent family, corresponding document</p>	

EPO FORM 1503 03/82 (P4/C01)



European Patent  
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# EUROPEAN SEARCH REPORT

Application Number  
EP 98 10 0166

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	<p>EP 0 136 524 A (ZENMI CO LTD)</p> <p>10 April 1985 (1985-04-10)</p> <p>* claims; figures * -----</p>	<p>1-6,11, 12,15, 18,19, 23-29, 36,37, 40,43, 44, 48-52, 55, 58-60, 62-65, 70,71,74</p>	
			<p>TECHNICAL FIELDS SEARCHED (Int.Cl.6)</p>
<p>The present search report has been drawn up for all claims</p>			
<p>Place of search</p> <p><b>THE HAGUE</b></p>		<p>Date of completion of the search</p> <p><b>25 January 2000</b></p>	<p>Examiner</p> <p><b>Mirza, A</b></p>
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone  Y : particularly relevant if combined with another document of the same category  A : technological background  O : non-written disclosure  P : intermediate document</p> <p>T : theory or principle underlying the invention  E : earlier patent document, but published on, or after the filing date  D : document cited in the application  L : document cited for other reasons  &amp; : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03 82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 98 10 0166

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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